



# SERVICE MANUAL

VHF AIR BAND TRANSCEIVERS

**IC-A4**  
**IC-A4E**

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## INTRODUCTION

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This service manual describe the latest information for the IC-A4/E at the time of publication.

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## DANGER

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**NEVER** connect the transceiver to an AC outlet or to a DC power supply that uses more than 16 V. Such a connection could cause a fire hazard and/or electric shock.

**DO NOT** expose the transceiver to rain, snow or any liquids.

**DO NOT** reverse the polarities of the power supply when connecting the transceiver.

**DO NOT** apply an RF signal of more than 20 dBm (100 mW) to the antenna connector. This could damage the transceiver's front end.

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## ORDERING PARTS

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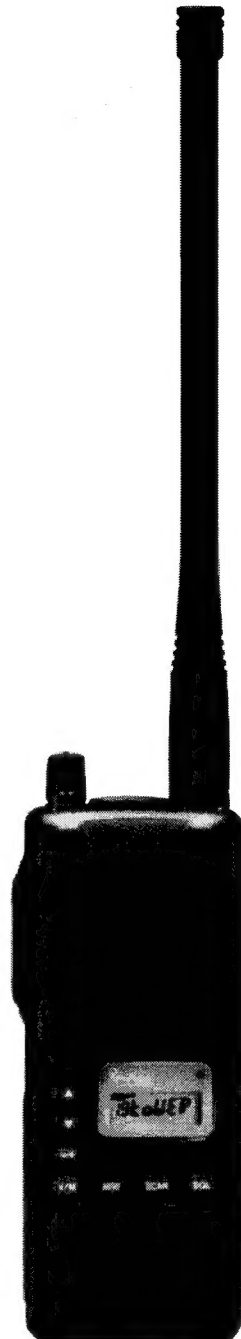
Be sure to include the following four points when ordering replacement parts:

1. 10-digit order numbers
2. Component part number and name
3. Equipment model name and unit name
4. Quantity required

**<SAMPLE ORDER>**

1110001810	S.IC	TA7368F	IC-A4/E	MAIN UNIT	1 piece
8810009510	Screw	B0 2×4 NI-ZU	IC-A4/E	MAIN PCB	6 pieces

Addresses are provided on the inside back cover for your convenience.



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## REPAIR NOTES

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1. Make sure a problem is internal before disassembling the transceiver.
2. DO NOT open the transceiver until the transceiver is disconnected from its power source.
3. DO NOT force any of the variable components. Turn them slowly and smoothly.
4. DO NOT short any circuits or electronic parts. An insulated tuning tool MUST be used for all adjustments.
5. DO NOT keep power ON for a long time when the transceiver is defective.
6. DO NOT transmit power into a signal generator or a sweep generator.
7. ALWAYS connect a 40 dB or 50 dB attenuator between the transceiver and a deviation meter or spectrum analyser when using such test equipment.
8. READ the instructions of test equipment thoroughly before connecting equipment to the transceiver.

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## SECTION 1 SPECIFICATIONS

### ■ GENERAL

- Frequency coverage : 118.000–136.975 MHz (Tx)  
108.000–136.975 MHz (Rx)
- Mode : 6K00A3E (AM)
- Number of memory channels : 19
- Acceptable power supply : 9.6 V DC  $\pm 15\%$  (negative ground)
- Usable temperature range :  $-10^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ ;  $+14^{\circ}\text{F}$  to  $+122^{\circ}\text{F}$
- Frequency stability :  $\pm 10$  ppm ( $0^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ )
- Current drain (at 9.6 V DC; typical) : Transmit at max. power 0.7 A  
Receive stand-by 55 mA  
max. audio 230 mA
- Antenna connector : BNC (50  $\Omega$ )
- Dimensions (projections not included) : 58(W) $\times$ 140.5(H) $\times$ 32.3(D) mm; 2 $\frac{9}{32}$ (W) $\times$ 5 $\frac{17}{32}$ (H) $\times$ 1 $\frac{9}{32}$ (D) in
- Weight (with antenna and battery pack) : 425 g; 15 oz

### ■ TRANSMITTER

- Output power (at 9.6 V DC) : 3.7 W (PEP)  
1.0 W (CW)
- Modulation : Low level modulation
- Modulation limiting : 80–100%
- Audio harmonic distortion : Less than 10% (at 60% modulation)
- Spurious emissions : More than 60 dB
- Hum and noise : More than 35 dB
- External microphone connector : 3-conductor 2.5 (d) mm ( $\frac{1}{10}$ "/150  $\Omega$ )

### ■ RECEIVER

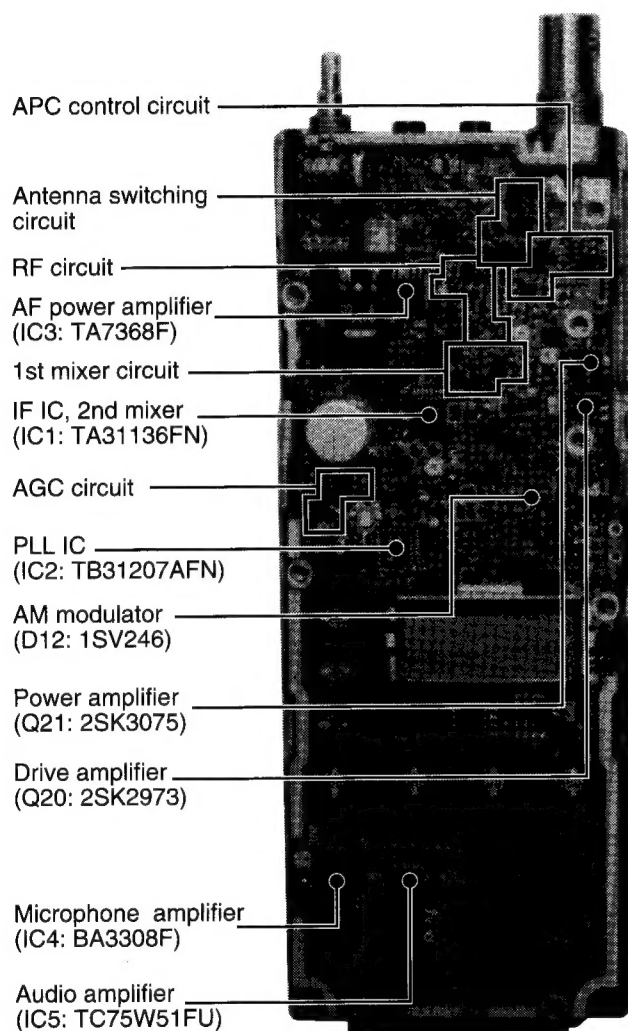
- Receive system : Double conversion superheterodyne system
- Intermediate frequencies : 1st 28.95 MHz  
2nd 450 kHz
- Sensitivity : Better than 1.0  $\mu\text{V}$  at 6 dB S/N
- Squelch sensitivity : Better than 1.0  $\mu\text{V}$  at threshold
- Selectivity : More than 8 kHz/–6 dB  
Less than 25 kHz/–60 dB
- Spurious response : More than 60 dB
- Hum and noise : More than 25 dB
- Audio output power (at 9.6 V DC) : More than 500 mW at 10% distortion with an 8  $\Omega$  load
- External speaker connector : 3-conductor 3.5 (d) mm ( $\frac{1}{8}$ "/8  $\Omega$ )

All stated specifications are subject to change without notice or obligation.

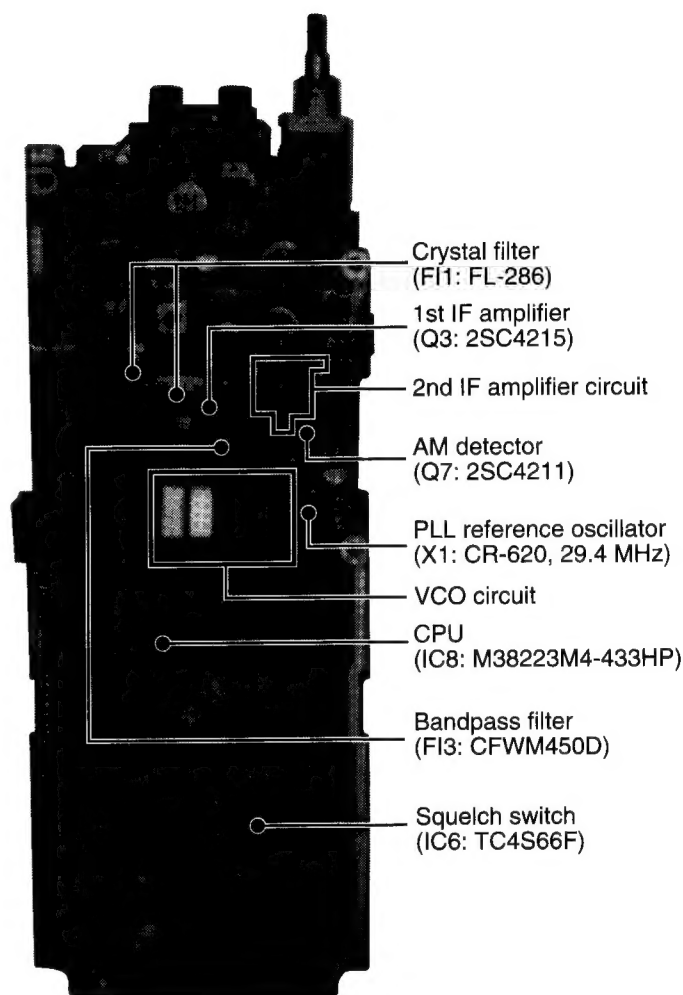
## SECTION 2 INSIDE VIEWS

### • MAIN UNIT

TOP VIEW



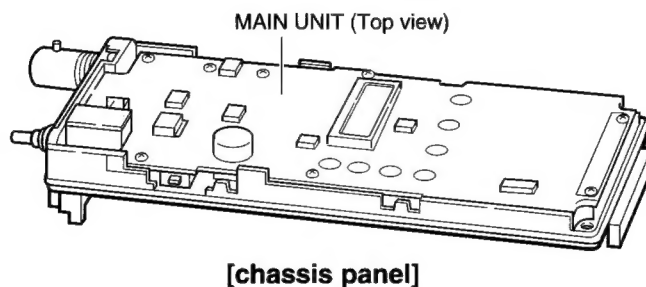
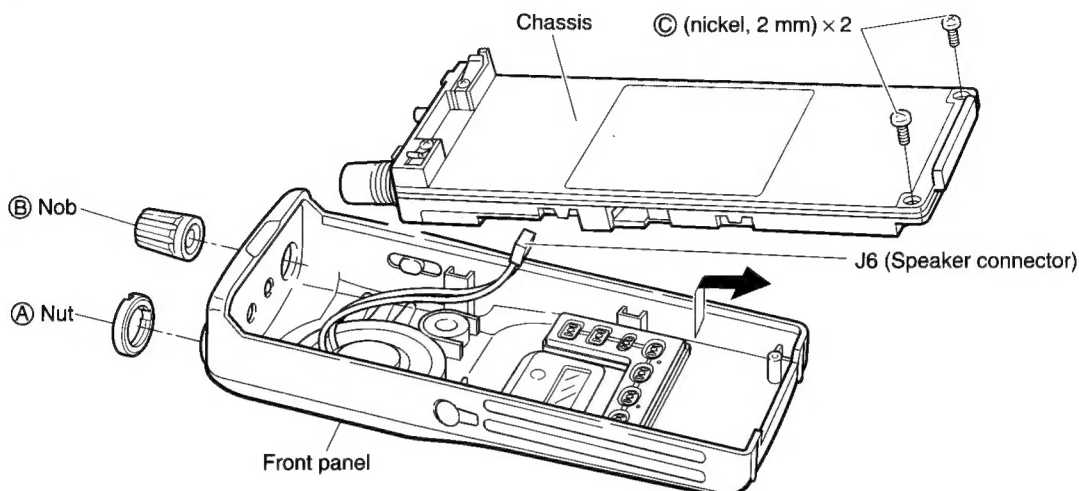
BOTTOM VIEW



## SECTION 3 DISASSEMBLY INSTRUCTIONS

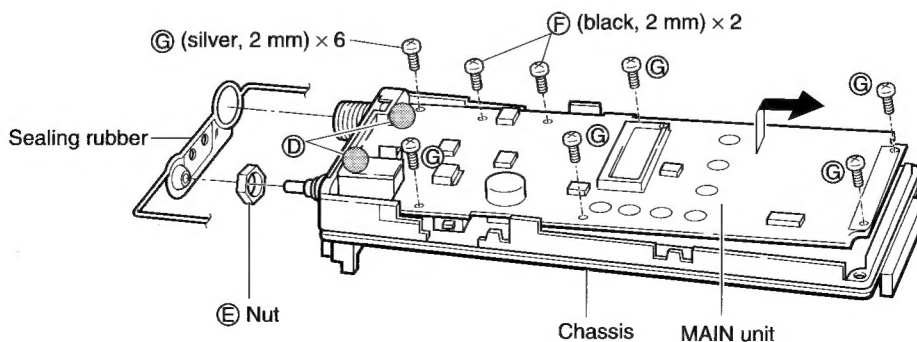
### • Removing the chassis panel

- ① Unscrew 1 nut (A), and remove 1 nob (B).
- ② Unscrew 2 screws, (C).
- ③ Take off the chassis in the direction of the arrow.
- ④ Unplug J6 to separate front panel and chassis.



### • Removing the MAIN unit

- ① Remove the sealing rubber.
- ② Unsolder 2 points (D) and unscrew 1 nut (E).
- ③ Unscrew 2 screws, (F), and 6 screws (G) (silver, 2 mm), to separate the chassis and MAIN unit.
- ④ Take off the MAIN unit in the direction of the arrow.



## SECTION 4 CIRCUIT DESCRIPTION

### 4-1 RECEIVER CIRCUITS

#### 1-1 ANTENNA SWITCHING CIRCUIT

Received signals from the antenna connector are passed through the low-pass filter (L1–L3, C1–C6). The filtered signals are applied to the  $\lambda/4$  type antenna switching circuit (D1, D2, L4, L5, C7–C9).

The antenna switching circuit functions as a low-pass filter while receiving. However, its impedance becomes very high while D1 and D2 are turned ON (while transmitting). Thus transmit signals are blocked from entering the receiver circuits. The passed signals are then applied to the RF amplifier circuit.

#### 4-1-2 RF CIRCUIT

The RF circuit amplifies signals within the range of frequency coverage and filters out-of-band signals.

The signals from the antenna switching circuit are passed through the tunable bandpass filter (D6, L24) then amplified at the RF amplifier (Q1). The amplified signals are again filtered at the 2-stage tunable bandpass filter (D7, D8, L10, L11). The filtered signals are applied to the 1st mixer circuit.

Varactor diodes are employed at the tunable bandpass filters (D6–D8) that track the filters and are controlled by the PLL lock voltage via the buffer amplifier (Q13). These diodes tune the center frequency of an RF passband for wide bandwidth receiving and good image response rejection.

#### 4-1-3 1st MIXER AND 1st IF CIRCUITS

The 1st mixer circuit converts the received signals to a fixed frequency of the 1st IF signal with a PLL output frequency. By changing the PLL frequency, only desired signals will be passed through a pair of crystal filters at the next stage of the 1st mixer.

The signals from the tunable bandpass filter are mixed at the 1st mixer circuit (Q2) with a 1st LO signal coming from the VCO circuit to produce a 28.95 MHz 1st IF signal.

The 1st IF signal is applied to a pair of crystal filters (F11a/b) to suppress out-of-band signals. The filtered 1st IF signal is applied to the IF amplifier (Q3), then applied to the 2nd mixer circuit (IC1, pin 16).

#### 4-1-4 2nd MIXER AND IF CIRCUITS

The 2nd mixer circuit converts the 1st IF signal to a 2nd IF signal. A double conversion superheterodyne system (which converts receive signals twice) improves the image rejection ratio and obtains stable receiver gain.

The 1st IF signal from the IF amplifier (Q3) is applied to the 2nd mixer section in the IF IC (IC1, pin 16), and is mixed with the 2nd LO signal to be converted into a 450 kHz 2nd IF signal.

The IF IC contains a 2nd mixer and a limiter amplifier. The PLL reference oscillator (X1) is used for the 2nd LO signal via the PLL IC (IC2, pins 14, 12), and is applied to pin 2 of the IF IC.

The mixed 2nd IF signal is output from pin 3 and passed through the ceramic bandpass filter (F13) to suppress unwanted heterodyne frequencies. It is then amplified at the 2nd IF amplifiers (Q4–Q6).

#### 4-1-5 AM DETECTOR CIRCUIT

The AM detector circuit converts the 2nd IF signal into AF signals.

The amplified 2nd IF signal from the 2nd IF amplifier (Q6) is applied to the AM detector circuit (Q7). It is then detected for conversion to AF signals.

The AF signals are applied to the AF circuit.

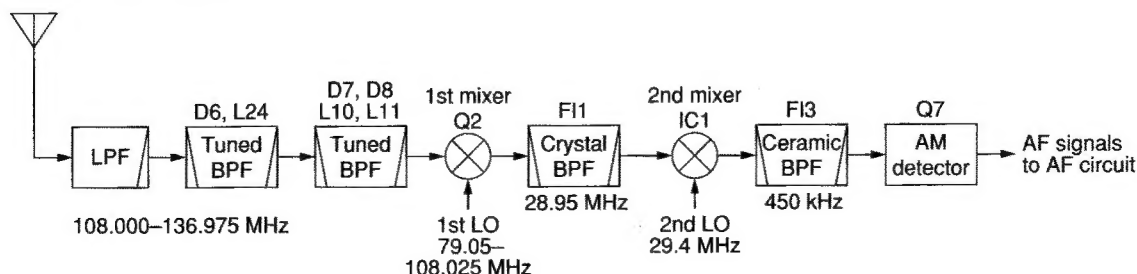
#### 4-1-6 AF CIRCUIT

The AF circuit amplifies the AF signals to the level needed to drive a speaker.

The AF signals from the AM detector circuit are applied to the audio amplifier (IC5b, pins 6, 7). The amplified signals are passed through the low-pass filter (IC5a, pins 3, 1), squelch switch (IC6, pins 1, 2), then applied to the [VOL] control (VR board, R401).

The level controlled AF signals from the [VOL] control are amplified at the AF power amplifier (IC3) to drive an internal speaker (SP1) via the [SP] jack (J1).

### • RECEIVER CONSTRUCTION



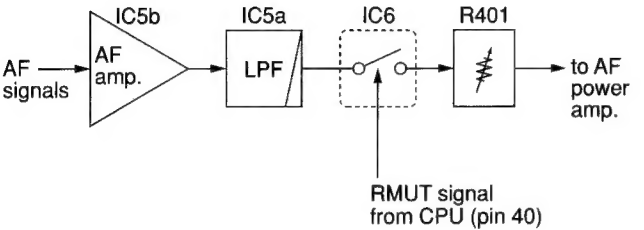
4-1-7 SQUELCH CIRCUIT

The squelch circuit cuts out AF signals when no RF signals are received.

A portion of the 2nd IF signal from the 2nd IF amplifier (Q4) is fed back to the IF IC (IC1, pin 5). The IF signal is amplified at the IF amplifier section in the IC, which then detects the receive signal strength at the RSSI section for conversion into DC voltage.

The DC voltage is applied to the CPU (IC8, pin 3) as the SQL signal after being amplified at the OP amplifier (IC11, pin 1). The CPU then outputs the squelch switch (IC6) control signal (RMUT) from pin 40.

• SQUELCH CIRCUIT

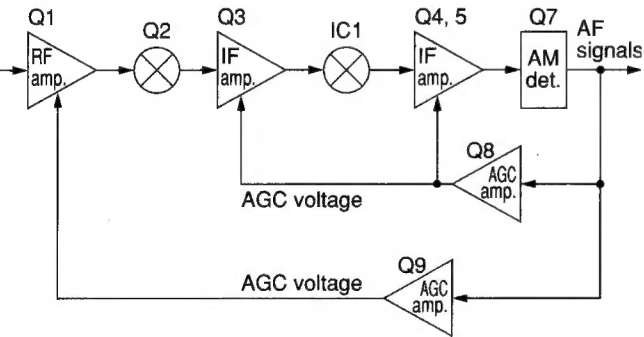


4-1-8 AGC CIRCUIT

The AGC (Automatic Gain Control) circuit reduces signal fading and keeps the audio output level constant.

AF signals from the AM detector circuit (Q7) are converted into DC voltage at the AGC amplifier circuits (Q8; for 1st/2nd IF amplifiers, Q9; for RF amplifier) by detecting the driving current at the AM detector. The DC voltage from the AGC amplifiers is applied to the 1st/2nd IF amplifiers (Q3–Q6) and the RF amplifier (Q1) to reduce the amplifier gain when strong signals are received.

• AGC CIRCUIT



4-2 TRANSMITTER CIRCUITS

4-2-1 MICROPHONE AMPLIFIER CIRCUIT

AF signals from the internal/external microphone are applied to the microphone amplifier (IC4) via the modulation depth adjustment pot (R110). The amplified signals are applied to the audio amplifier (IC5b) and low-pass filter (IC5a). The passed signals are applied to the modulation circuit.

When the side tone function is turned ON and a headset is connected to the transceiver, RMUT and AF-ON signals from the CPU (IC8, pins 40, 42) are released. Thus a portion of the audio signals from the low-pass filter (IC5a) are passed through the squelch switch (IC6), [VOL] control (R401), and then applied to the AF power amplifier (IC3) to drive the headset speakers via the [SP] jack.

4-2-2 MODULATION CIRCUIT

The audio signals from the microphone amplifier circuit are applied to the AM modulator circuit (D12) to modulate transmit signals from the VCO circuit (VCO board, Q501, Q502).

2-3 DRIVE/POWER AMPLIFIER CIRCUITS

The drive amplifier circuit amplifies the transmit signal to a level needed for the power amplifier circuit. The power amplifier circuit amplifies this to obtain a specified transmit output power.

The modulated transmit signal is amplified at the drive amplifier (Q20) after being amplified at the YGR amplifiers (Q18, Q19). The amplified signal is power amplified at the power amplifier (Q21) to obtain 1 W of RF (carrier) power.

The power amplified signal is then applied to the antenna connector (J1) via the ALC detector and low-pass filter circuits.

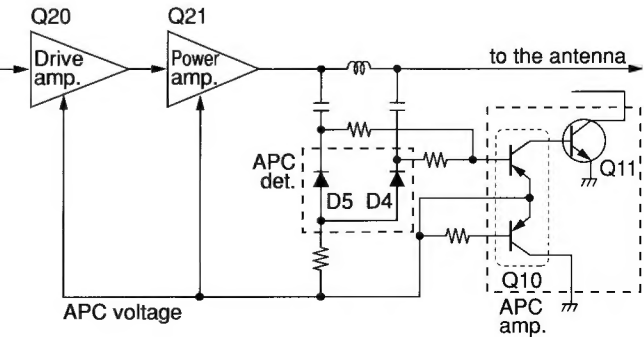
4-2-4 APC CIRCUIT

The APC (Automatic Power Control) circuit protects the drive and power amplifiers from mismatched output loads.

The APC detector circuit (D4, D5) detects forward and rectified signals respectively. The combined voltage is at a minimum level when the antenna is matched at 50  $\Omega$  and is increased when it is mismatched.

The detected voltage is applied to one of the APC amplifier inputs (Q10, pin 1; base). When the antenna impedance is mismatched, the detected voltage exceeds the reference voltage. Thus the bias voltage of the drive and power amplifier is decreased.

• APC CIRCUIT





## 4-3 PLL CIRCUITS

A PLL circuit provides stable oscillation of the transmit frequency and receive 1st LO frequency. The PLL output compares the phase of the divided VCO frequency to the reference frequency. The PLL output frequency is controlled by the divided ratio (N-data) of a programmable divider.

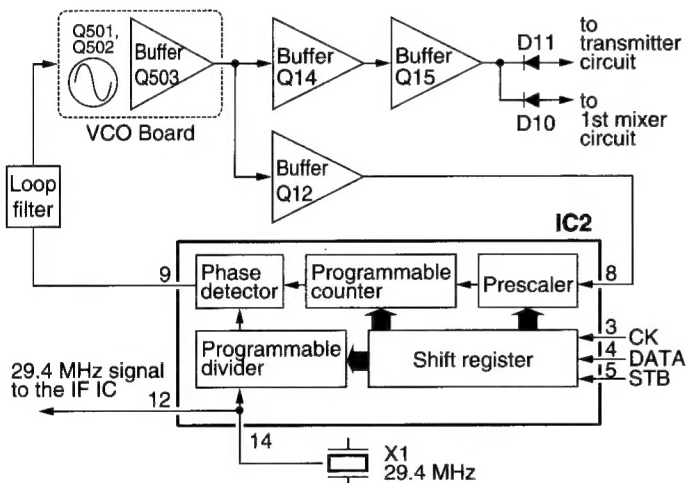
The PLL circuit contains of the VCO circuit (VCO board, Q501, Q502). The oscillated signal is amplified at the buffer amplifier (VCO board, Q503) then applied to the PLL circuit in the MAIN unit.

The PLL IC (IC2) contains a prescaler, programmable counter, phase detector and charge pump, etc. The entered signal is divided at the prescaler and programmable counter section by the N-data ratio from the CPU. The divided signal is detected on phase at the phase detector using the reference frequency.

If the oscillated signal drifts, its phase changes from that of the reference frequency, causing a lock voltage change to compensate for the drift in the oscillated frequency.

A portion of the VCO signal is amplified at the buffer amplifiers (Q14, Q15) and is then applied to the receive 1st mixer or transmit buffer amplifier circuit via the T/R switching diode (D10, D11).

### • PLL circuit



## 4-4 POWER SUPPLY CIRCUITS

Line	Description
BATT	The voltage from the connected battery pack.
VCC	Same voltage as the BATT line controlled by the [PWR/VOL] control.
+5	Common 5 V converted from the VCC line at the +5 regulator circuit (IC7).
5V	Common 5 V converted from the VCC line at the 5V regulator circuit (Q22, Q23) using the 5V line voltage for reference.
T5	Transmit 5 V converted from the VCC line at the T5 regulator circuit (Q25, Q26).
R5V	Receive 5 V converted from the 5V line at the R5 regulator circuit (Q24). The regulated voltage is applied to the receiver circuits.

## 4-5 PORT ALLOCATIONS

### CPU (IC8)

Pin number	Port name	Description
1	PDET	Input port for the ALC detector circuit (D4, D5) for power detection.
2	LBATT	Input port for the VCC voltage (connected battery voltage) for low battery detection.
3	RSSI	Input port for noise signal (pulse-type) for noise squelch operation.
10	BEEP	Outputs beep audio signals while receiving.
13	SQL	Input port for the [SQL] switch. Low : While [SQL] is pushed
17	SCL	Outputs clock signal for the EEPROM (IC10).
18	SDATA	Data bus line for the EEPROM (IC10).
21	TRC	Outputs transmit/receive select signal. High : While transmitting
24	PTT	Input ports for the [PTT] switch. High : While [PTT] is pushed
32	SCAN	Input port for the [SCAN] switch. Low : While [SCAN] is pushed
33	MW	Input port for the [MW] switch. Low : While [MW] is pushed
34	V/M	Input port for the [V/M] switch. Low : While [V/M] is pushed
35	LOCK	Input port for the [LOCK] switch. Low : While [LOCK] is pushed
36	DN	Input port for the [DOWN] switch. Low : While [DOWN] is pushed
37	UP	Input port for the [UP] switch. Low : While [UP] is pushed
38	LOK	Input port for PLL unlock signal. Low : During unlock
39	TMUT	Outputs transmit mute control signal. High : While transmitting
40	RMUT	Outputs receive mute control signal. High : While receiving
41	LIGHT	Outputs LCD backlight control signal. High : When backlighting is ON
42	AFON	Outputs AF regulator circuit control signal. High : While receiving
44	ENB	Output strobe signals for PLL circuit.
45	CK	Outputs clock signal for PLL circuit.
46	DATA	Outputs data signal for PLL circuit.

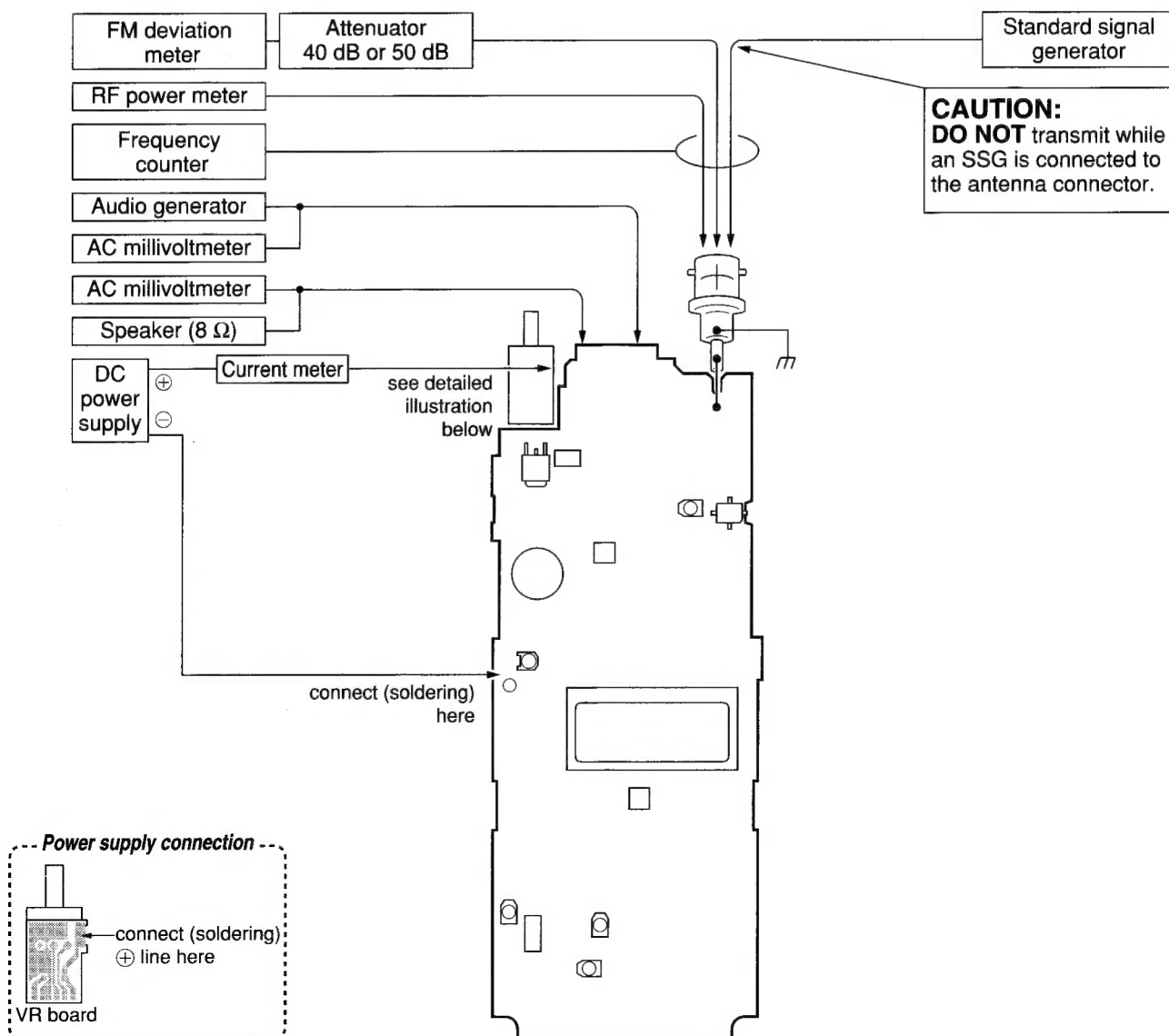
# SECTION 5 ADJUSTMENT PROCEDURES

## 5-1 PREPARATION

### ■ REQUIRED TEST EQUIPMENT

EQUIPMENT	GRADE AND RANGE	EQUIPMENT	GRADE AND RANGE
DC power supply	Output voltage : 9.6 V DC Current capacity : 3 A or more	Standard signal generator (SSG)	Frequency range : 0.1–300 MHz Output level : 0.1 $\mu$ V–32 mV (–127 to –17 dBm)
RF power meter (terminated type)	Measuring range : 1–10 W Frequency range : 100–300 MHz Impedance : 50 $\Omega$ SWR : Less than 1.2 : 1	Oscilloscope	Frequency range : DC–20 MHz Measuring range : 0.01–20 V
Frequency counter	Frequency range : 0.1–300 MHz Frequency accuracy : $\pm 1$ ppm or better Sensitivity : 100 mV or better	DC voltmeter	Input impedance : 50 k $\Omega$ /V DC or better
RF voltmeter	Frequency range : 0.1–300 MHz Measuring range : 0.01–10 V	AC millivoltmeter	Measuring range : 10 mV–10 V
Modulation analyzer	Frequency range : DC–300 MHz Measuring range : 0 to 100%	Digital multimeter	Input impedance : 10 M $\Omega$ /V DC or better
Audio generator	Frequency range : 300–3000 Hz Measuring range : 1–500 mV	Current meter	Measuring range : 1 A or more
		Attenuator	Power attenuation : 40 or 50 dB Capacity : 10 W or more
		Terminator	Impedance : 50 $\Omega$ Capacity : 10 W or more

### ■ CONNECTION

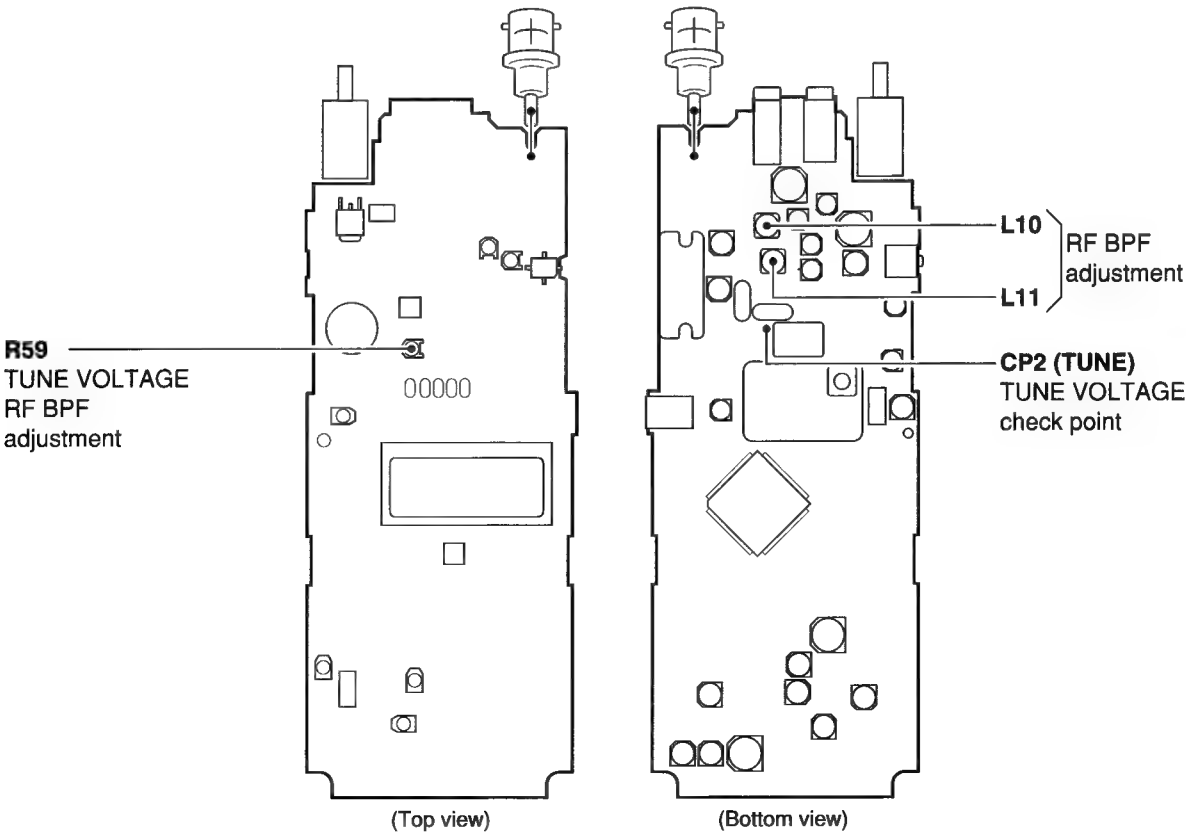


5-2 RECEIVER ADJUSTMENT

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT	
			UNIT	LOCATION		UNIT	ADJUST
TUNE VOLTAGE	1	<ul style="list-style-type: none"><li>• Operating frequency :108.000 MHz</li><li>• Receiving</li></ul>	MAIN	Connect a digital multi-meter to the check point CP2 (TUNE).	1.35 V	MAIN	R59
RF BPF	1	<ul style="list-style-type: none"><li>• Operating frequency :108.000 MHz</li><li>• Connect an SSG to the antenna connector and set an SSG as:<ul style="list-style-type: none"><li>Level : 1.0 <math>\mu</math>V* (-107 dBm)</li><li>Modulation : 1 kHz</li><li>Mod. depth : 30%</li></ul></li><li>• Receiving</li></ul>	Top panel	Connect an AC millivoltmeter with an 8 $\Omega$ load to the [SP] jack.	Maximum output level	MAIN	L10, L11
	2	<ul style="list-style-type: none"><li>• Operating frequency : 136.975 MHz</li><li>• Receiving</li></ul>					R59
SQUELCH ADJUSTMENT (preparation)	1	<ul style="list-style-type: none"><li>• Stores the frequency 118.100 MHz into memory channel 19.</li><li>• Apply square wave form (10 mV) to the [MIC] jack and turn power ON while pushing the [SQL] and [LOCK].</li></ul>	Front panel	LCD	LCD indicates "sq ADJ-3".	Front panel	Verify
SQUELCH ADJUSTMENT	2	<ul style="list-style-type: none"><li>• Connect an SSG to the antenna connector and set as:<ul style="list-style-type: none"><li>Level : 0.71 <math>\mu</math>V* (-110 dBm)</li><li>Modulation : OFF</li></ul></li><li>• Receiving</li></ul>			LCD indicates "sq ADJ-9" after the operation.		Push and hold [MW].
	3	<ul style="list-style-type: none"><li>• Set an SSG as:<ul style="list-style-type: none"><li>Level : 3.2 <math>\mu</math>V* (-97 dBm)</li></ul></li><li>• Receiving</li></ul>					

\*The output level of the standard signal generator (SSG) is indicated as the SSG's open circuit.

• MAIN UNIT



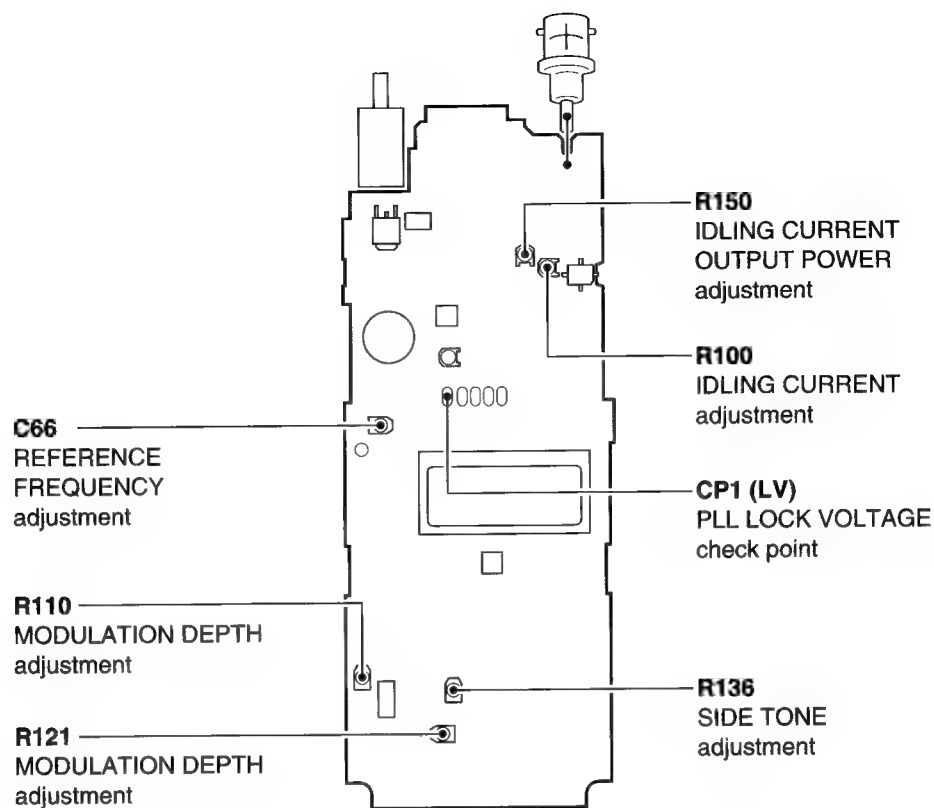
### 5-3 PLL ADJUSTMENT

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT	
			UNIT	LOCATION		UNIT	ADJUST
PLL LOCK VOLTAGE	1	<ul style="list-style-type: none"> <li>Operating frequency : 136.975 MHz</li> <li>Receiving</li> </ul>	MAIN	Connect a digital multi-meter to the check point CP1 (LV).	3.4 V	VCO board	L502
REFERENCE FREQUENCY	1	<ul style="list-style-type: none"> <li>Operating frequency : 136.975 MHz</li> <li>Transmitting</li> </ul>	Top panel	Connect an RF power meter or a terminator to the antenna connector and loosely couple a frequency counter.	136.975000 MHz	MAIN	C66

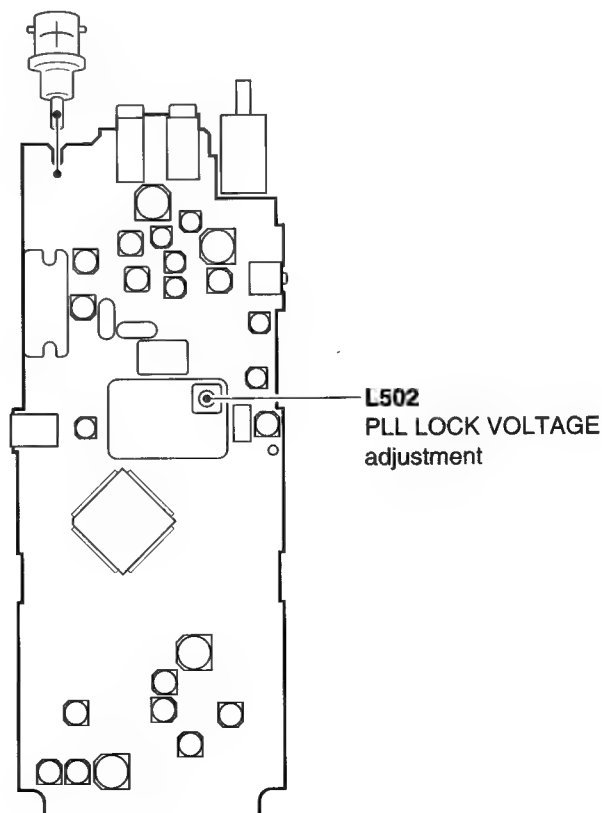
### 5-4 TRANSMITTER ADJUSTMENT

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT	
			UNIT	LOCATION		UNIT	ADJUST
IDLING CURRENT	1	<ul style="list-style-type: none"> <li>Operating frequency : 136.975 MHz</li> <li>Transmitting</li> </ul>	Top panel	Connect an RF power meter to the antenna connector.	Minimum level (Less than 0.05 W)	MAIN	R150
	2		Rear panel	Connect a current meter between the transceiver and a power supply.	580 mA		R100
OUTPUT POWER	1	<ul style="list-style-type: none"> <li>Operating frequency : 118.025 MHz</li> <li>Apply no audio signals to the [MIC] jack.</li> <li>Transmitting</li> </ul>	Top panel	Connect an RF power meter to the antenna connector.	1.0 W	MAIN	R150
MODULATION DEPTH	1	<ul style="list-style-type: none"> <li>Operating frequency : 118.025 MHz</li> <li>Connect an audio generator to the [MIC] jack and set as: 1 kHz/200 mV</li> <li>Set a modulation analyzer as: HPF : OFF LPF : OFF De-emphasis : OFF Detector : (P-P)/2</li> <li>Pre-set R110 and R121 to the center position.</li> <li>Transmitting</li> </ul>	Top panel	Connect a modulation analyzer to the antenna connector through an attenuator.	85%	MAIN	R121
	2	<ul style="list-style-type: none"> <li>Set an audio generator's output to 20 mV</li> <li>Transmitting</li> </ul>			30%		R110
SIDE TONE	1	<ul style="list-style-type: none"> <li>Operating frequency : Any</li> <li>Connect an audio generator to the [MIC] jack and set as: 1 kHz/200 mV</li> <li>Side tone function : ON</li> <li>Transmitting</li> </ul>	Top panel	Connect an AC millivoltmeter with an 8 $\Omega$ load to the [SP] jack and an RF power meter or a dummy load to the antenna connector.	0.4 V	MAIN	R136

• MAIN UNIT (Top view)



• MAIN UNIT (Bottom view)



# SECTION 6 PARTS LIST

## [MAIN UNIT]

REF NO.	ORDER NO.	DESCRIPTION	
IC1	1110003490	S.IC	TA31136FN(D,EL)
IC2	1130008830	S.IC	TB31207AFN(EL)
IC3	1110001810	S.IC	TA7368F(TP1)
IC4	1110003670	S.IC	BA3308F-T1
IC5	1130007650	S.IC	TC75W51FU (TE12L)
IC6	1130004200	S.IC	TC4S66F (TE85R)
IC7	1180000800	S.IC	S-81350HG-KD-T1
IC8	1140007290	S.IC	M38223M4-433-HP
IC9	1110004750	S.IC	S-80945ALMP-DA9-T2
IC10	1140003610	S.IC	X24C04S8-2.7T6
IC11	1110002400	S.IC	NJM2107F(TE1)
Q1	1580000650	S.FET	3SK230-T2 U1B
Q2	1580000400	S.FET	3SK151-Y (TE85R)
Q3	1530002600	S.TRANSISTOR	2SC4215-O (TE85R)
Q4	1530002600	S.TRANSISTOR	2SC4215-O (TE85R)
Q5	1530002600	S.TRANSISTOR	2SC4215-O (TE85R)
Q6	1530002600	S.TRANSISTOR	2SC4215-O (TE85R)
Q7	1530003280	S.TRANSISTOR	2SC4211-6-TL
Q8	1540000520	S.TRANSISTOR	2SD1819A(TX)R
Q9	1540000520	S.TRANSISTOR	2SD1819A(TX)R
Q10	1590001520	S.TRANSISTOR	UMS1 TL
Q11	1530003280	S.TRANSISTOR	2SC4211-6-TL
Q12	1530002560	S.TRANSISTOR	2SC4403-3-TL
Q13	1590001650	S.TRANSISTOR	XP4601(TX)
Q14	1530002560	S.TRANSISTOR	2SC4403-3-TL
Q15	1530002560	S.TRANSISTOR	2SC4403-3-TL
Q16	1530002850	S.TRANSISTOR	2SC4116-BL (TE85R)
Q17	1590001140	S.TRANSISTOR	UN9210(TX)
Q18	1530002560	S.TRANSISTOR	2SC4403-3-TL
Q19	1530003340	S.TRANSISTOR	2SC3357-T2 RF
Q20	1560001020	S.FET	2SK2973 (MTS101P)
Q21	1560001060	S.FET	2SK3075 (TE12L)
Q22	1530003280	S.TRANSISTOR	2SC4211-6-TL
Q23	1520000460	S.TRANSISTOR	2SB1132 T100 R
Q24	1510000770	S.TRANSISTOR	2SA1586-GR (TE85R)
Q25	1530003280	S.TRANSISTOR	2SC4211-6-TL
Q26	1520000460	S.TRANSISTOR	2SB1132 T100 R
Q27	1530003280	S.TRANSISTOR	2SC4211-6-TL
Q28	1520000650	S.TRANSISTOR	2SB1201-S-TL
Q29	1520000460	S.TRANSISTOR	2SB1132 T100 R
Q30	1520000460	S.TRANSISTOR	2SB1132 T100 R
Q31	1510000880	S.TRANSISTOR	2SA1622-6-TL
Q32	1590001150	S.TRANSISTOR	UN9211(TX)
Q33	1590001980	S.TRANSISTOR	XP4315(TX)
Q35	1590001150	S.TRANSISTOR	UN9211(TX)
Q38	1530003280	S.TRANSISTOR	2SC4211-6-TL
Q39	1590000850	S.TRANSISTOR	DTC114YU T107
D1	1790000620	S.DIODE	MA77(TW)
D2	1790000620	S.DIODE	MA77(TW)
D3	1790000620	S.DIODE	MA77(TW)
D4	1790000660	S.DIODE	MA728(TW)
D5	1790000660	S.DIODE	MA728(TW)
D6	1790001290	S.VARICAP	MA304(TX)
D7	1790001290	S.VARICAP	MA304(TX)
D8	1790001290	S.VARICAP	MA304(TX)
D9	1790000860	S.DIODE	MA133(TX)
D10	1790000620	S.DIODE	MA77(TW)
D11	1790000620	S.DIODE	MA77(TW)
D12	1750000460	S.DIODE	1SV246-TL
D13	1750000460	S.DIODE	1SV246-TL
D14	1790001330	S.ZENER	MA8036-L(TX)
D15	1790001280	S.DIODE	MA111(TX)
D16	1790001280	S.DIODE	MA111(TX)
D17	1790000860	S.DIODE	MA133(TX)
D18	1790000670	S.DIODE	SB07-03C-TB
D19	1790000860	S.DIODE	MA133(TX)
D20	1790001280	S.DIODE	MA111(TX)
D22	1790001280	S.DIODE	MA111(TX)
D23	1730002270	S.ZENER	MA8024(TX)
D24	1790000990	S.ZENER	MA8051-H(TX)

## [MAIN UNIT]

REF NO.	ORDER NO.	DESCRIPTION	
F1	2010002250	CRYSTAL	28M16B (FL-286; 28.950 MHz)
F13	2020001540	CERAMIC	CFWM450D
X1	6050010420	CRYSTAL	CR-620 (29.4000 MHz)
X2	6050009020	S.CERAMIC	EFOS4194E3
L1	6200008280	S.COIL	0.30-1.7-TTL 50N
L2	6200008300	S.COIL	0.35-1.6-9TL 65N
L3	6200008300	S.COIL	0.35-1.6-9TL 65N
L4	6200008260	S.COIL	0.30-1.7-8TL 60N
L5	6200008300	S.COIL	0.35-1.6-9TL 65N
L6	6200008170	S.COIL	0.35-1.6-8TL 54N
L7	6200001220	S.COIL	MLF2012D R82M-T
L8	6200004720	S.COIL	MLF1608D R10K-T
L9	6200001630	S.COIL	ELJNC R10K-F
L10	6150005000	S.COIL	LS-527
L11	6150005000	S.COIL	LS-527
L12	6200002240	S.COIL	ELJFC 2R2K-F
L13	6200001310	S.COIL	MLF2012A 4R7M-T
	6200002190	S.COIL	MLF2012A 4R7K-T
L14	6200003350	S.COIL	ELJNC R27K-F
L15	6200003350	S.COIL	ELJNC R27K-F
L16	6200001310	S.COIL	MLF2012A 4R7M-T
L17	6200001630	S.COIL	ELJNC R10K-F
L18	6200008190	S.COIL	0.25-1.9-8TL 80N
L19	6200007000	S.COIL	ELJRE 82NG-F
L20	6200002370	S.COIL	LQN 1A 39NJ04
L21	6200008400	S.COIL	0.35-1.6-6TL 36N
L22	6200005720	S.COIL	ELJRE 33NG-F
L23	6200008480	S.COIL	0.30-1.4-5TR 25N
L24	6200001770	S.COIL	ELJNC 47NK-F
L26	6200003590	S.COIL	EXCCL3225U1
L27	6200004720	S.COIL	MLF1608D R10K-T
R1	7030000260	S.RESISTOR	MCR10EZHZ 100 $\Omega$ (101)
R2	7030003370	S.RESISTOR	ERJ3GEYJ 271 V (270 $\Omega$ )
R3	7030003370	S.RESISTOR	ERJ3GEYJ 271 V (270 $\Omega$ )
R4	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 k $\Omega$ )
R5	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 k $\Omega$ )
R6	7030003620	S.RESISTOR	ERJ3GEYJ 333 V (33 k $\Omega$ )
R9	7030003720	S.RESISTOR	ERJ3GEYJ 224 V (220 k $\Omega$ )
R11	7030003700	S.RESISTOR	ERJ3GEYJ 154 V (150 k $\Omega$ )
R12	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 k $\Omega$ )
R13	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 k $\Omega$ )
R14	7030003770	S.RESISTOR	ERJ3GEYJ 564 V (560 k $\Omega$ )
R15	7030003280	S.RESISTOR	ERJ3GEYJ 470 V (47 $\Omega$ )
R17	7030003280	S.RESISTOR	ERJ3GEYJ 470 V (47 $\Omega$ )
R18	7030003720	S.RESISTOR	ERJ3GEYJ 224 V (220 k $\Omega$ )
R19	7030003720	S.RESISTOR	ERJ3GEYJ 224 V (220 k $\Omega$ )
R20	7030003720	S.RESISTOR	ERJ3GEYJ 224 V (220 k $\Omega$ )
R21	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 k $\Omega$ )
R22	7030003800	S.RESISTOR	ERJ3GEYJ 105 V (1 M $\Omega$ )
R23	7030003760	S.RESISTOR	ERJ3GEYJ 474 V (470 k $\Omega$ )
R24	7030003670	S.RESISTOR	ERJ3GEYJ 823 V (82 k $\Omega$ )
R25	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 k $\Omega$ )
R26	7030003290	S.RESISTOR	ERJ3GEYJ 560 V (56 $\Omega$ )
R27	7030003470	S.RESISTOR	ERJ3GEYJ 182 V (1.8 k $\Omega$ )
R28	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 $\Omega$ )
R29	7030003460	S.RESISTOR	ERJ3GEYJ 152 V (1.5 k $\Omega$ )
R30	7030003770	S.RESISTOR	ERJ3GEYJ 564 V (560 k $\Omega$ )
R31	7030003480	S.RESISTOR	ERJ3GEYJ 222 V (2.2 k $\Omega$ )
R32	7030003500	S.RESISTOR	ERJ3GEYJ 332 V (3.3 k $\Omega$ )
R33	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 k $\Omega$ )
R34	7030003460	S.RESISTOR	ERJ3GEYJ 152 V (1.5 k $\Omega$ )
R35	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 k $\Omega$ )
R36	7030003760	S.RESISTOR	ERJ3GEYJ 474 V (470 k $\Omega$ )
R37	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 k $\Omega$ )
R38	7030003480	S.RESISTOR	ERJ3GEYJ 222 V (2.2 k $\Omega$ )
R39	7030003520	S.RESISTOR	ERJ3GEYJ 472 V (4.7 k $\Omega$ )
R40	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 k $\Omega$ )
R41	7030003760	S.RESISTOR	ERJ3GEYJ 474 V (470 k $\Omega$ )

S.=Surface mount

# **[MAIN UNIT]**

REF NO.	ORDER NO.	DESCRIPTION	
R42	7030003480	S.RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R43	7030003520	S.RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R44	7030003700	S.RESISTOR	ERJ3GEYJ 154 V (150 kΩ)
R45	7030003650	S.RESISTOR	ERJ3GEYJ 563 V (56 kΩ)
R46	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R47	7030003480	S.RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R48	7030003650	S.RESISTOR	ERJ3GEYJ 563 V (56 kΩ)
R49	7030003730	S.RESISTOR	ERJ3GEYJ 274 V (270 kΩ)
R50	7030003520	S.RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R51	7030003700	S.RESISTOR	ERJ3GEYJ 154 V (150 kΩ)
R52	7030003720	S.RESISTOR	ERJ3GEYJ 224 V (220 kΩ)
R53	7510001000	S.THERMISTOR	TBPS1R154K475H5Q
R54	7030003720	S.RESISTOR	ERJ3GEYJ 224 V (220 kΩ)
R55	7030003690	S.RESISTOR	ERJ3GEYJ 124 V (120 kΩ)
R56	7030003650	S.RESISTOR	ERJ3GEYJ 563 V (56 kΩ)
R57	7030003750	S.RESISTOR	ERJ3GEYJ 394 V (390 kΩ)
R58	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R59	7310003600	S.TRIMMER	EVM-1XSX50 B54 (503)
R60	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R61	7030003480	S.RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R62	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R63	7030003480	S.RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R64	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R65	7030003220	S.RESISTOR	ERJ3GEYJ 150 V (15 Ω)
R66	7030003460	S.RESISTOR	ERJ3GEYJ 152 V (1.5 kΩ)
R67	7030003360	S.RESISTOR	ERJ3GEYJ 221 V (220 Ω)
R68	7030003400	S.RESISTOR	ERJ3GEYJ 471 V (470 Ω)
R69	7030003650	S.RESISTOR	ERJ3GEYJ 563 V (56 kΩ)
R70	7030003400	S.RESISTOR	ERJ3GEYJ 471 V (470 Ω)
R72	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R73	7030003370	S.RESISTOR	ERJ3GEYJ 271 V (270 Ω)
R74	7030003610	S.RESISTOR	ERJ3GEYJ 273 V (27 kΩ)
R75	7030003340	S.RESISTOR	ERJ3GEYJ 151 V (150 Ω)
R76	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R77	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R78	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R79	7030003400	S.RESISTOR	ERJ3GEYJ 471 V (470 Ω)
R80	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R81	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R82	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R83	7030003360	S.RESISTOR	ERJ3GEYJ 221 V (220 Ω)
R84	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R85	7030003620	S.RESISTOR	ERJ3GEYJ 333 V (33 kΩ)
R86	7030003360	S.RESISTOR	ERJ3GEYJ 221 V (220 Ω)
R87	7030003580	S.RESISTOR	ERJ3GEYJ 153 V (15 kΩ)
R88	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R89	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R90	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R91	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R92	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R93	7030003480	S.RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R94	7030003290	S.RESISTOR	ERJ3GEYJ 560 V (56 Ω)
R95	7030003260	S.RESISTOR	ERJ3GEYJ 330 V (33 Ω)
R96	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R97	7030003570	S.RESISTOR	ERJ3GEYJ 123 V (12 kΩ)
R99	7030003260	S.RESISTOR	ERJ3GEYJ 330 V (33 Ω)
R100	7310003600	S.TRIMMER	EVM-1XSX50 B54 (503)
R101	7030003600	S.RESISTOR	ERJ3GEYJ 223 V (22 kΩ)
R102	7030003590	S.RESISTOR	ERJ3GEYJ 183 V (18 kΩ)
R103	7030003760	S.RESISTOR	ERJ3GEYJ 474 V (470 kΩ)
R104	7030003400	S.RESISTOR	ERJ3GEYJ 471 V (470 Ω)
R105	7030003390	S.RESISTOR	ERJ3GEYJ 391 V (390 Ω)
R106	7030003350	S.RESISTOR	ERJ3GEYJ 181 V (180 Ω)
R107	7030003200	S.RESISTOR	ERJ3GEYJ 100 V (10 Ω)
R108	7030003600	S.RESISTOR	ERJ3GEYJ 223 V (22 kΩ)
R109	7030003620	S.RESISTOR	ERJ3GEYJ 333 V (33 kΩ)
R110	7310003610	S.TRIMMER	EVM-1XSX50 B14 (103)
R111	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R112	7030003270	S.RESISTOR	ERJ3GEYJ 390 V (39 Ω)
R113	7030003580	S.RESISTOR	ERJ3GEYJ 153 V (15 kΩ)
R114	7510000960	S.THERMISTOR	TBPS1R104K475H5Q
R115	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R116	7030003690	S.RESISTOR	ERJ3GEYJ 124 V (120 kΩ)
R117	7030003800	S.RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R118	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R119	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R120	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R121	7310003660	S.TRIMMER	EVM-1XSX50 B55 (504)
R122	7030003630	S.RESISTOR	ERJ3GEYJ 393 V (39 kΩ)
R123	7030003630	S.RESISTOR	ERJ3GEYJ 393 V (39 kΩ)
R124	7030003630	S.RESISTOR	ERJ3GEYJ 393 V (39 kΩ)
R126	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)

# **[MAIN UNIT]**

REF NO.	ORDER NO.	DESCRIPTION	
R127	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R128	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R129	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R130	7030003500	S.RESISTOR	ERJ3GEYJ 332 V (3.3 kΩ)
R131	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R132	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R133	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R134	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R135	7030003590	S.RESISTOR	ERJ3GEYJ 183 V (18 kΩ)
R136	4610001530	S.TRIMMER	EVM-1XSX50 B13 (102)
R137	7030000180	S.RESISTOR	MCR10EZJH 22 Ω (220)
R138	7030000180	S.RESISTOR	MCR10EZJH 22 Ω (220)
R139	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R140	7030000170	S.RESISTOR	MCR10EZJH 18 Ω (180)
R141	7030000280	S.RESISTOR	MCR10EZJH 150 Ω (151)
R142	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R143	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R144	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R145	7030003440	S.RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R146	7030003620	S.RESISTOR	ERJ3GEYJ 333 V (33 kΩ)
R147	7030003620	S.RESISTOR	ERJ3GEYJ 333 V (33 kΩ)
R148	7030003600	S.RESISTOR	ERJ3GEYJ 223 V (22 kΩ)
R149	7030003660	S.RESISTOR	ERJ3GEYJ 683 V (68 kΩ)
R150	7310003600	S.TRIMMER	EVM-1XSX50 B54 (503)
R151	7030003620	S.RESISTOR	ERJ3GEYJ 333 V (33 kΩ)
R152	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R153	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R154	7030003800	S.RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R155	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R156	7030003660	S.RESISTOR	ERJ3GEYJ 683 V (68 kΩ)
R157	7030003620	S.RESISTOR	ERJ3GEYJ 333 V (33 kΩ)
R158	7030003620	S.RESISTOR	ERJ3GEYJ 333 V (33 kΩ)
R159	7030003620	S.RESISTOR	ERJ3GEYJ 333 V (33 kΩ)
R160	7030003590	S.RESISTOR	ERJ3GEYJ 183 V (18 kΩ)
R166	7030003580	S.RESISTOR	ERJ3GEYJ 153 V (15 kΩ)
R167	7030003580	S.RESISTOR	ERJ3GEYJ 153 V (15 kΩ)
R168	7030003400	S.RESISTOR	ERJ3GEYJ 471 V (470 Ω)
R169	7030008140	S.RESISTOR	RR0816P-224-D (220 kΩ)
R170	7030005870	S.RESISTOR	RR0816R-104-D (100 kΩ)
R171	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R172	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R173	7030003540	S.RESISTOR	ERJ3GEYJ 682 V (6.8 kΩ)
R174	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R175	7030003400	S.RESISTOR	ERJ3GEYJ 471 V (470 Ω)
R177	7030003560	S.RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R180	7030003640	S.RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R181	7030003600	S.RESISTOR	ERJ3GEYJ 223 V (22 kΩ)
R182	7030003820	S.RESISTOR	ERJ3GEYJ 155 V (1.5 MΩ)
R183	7030003800	S.RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R184	7030003800	S.RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R186	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R187	7030003680	S.RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R188	7030003620	S.RESISTOR	ERJ3GEYJ 333 V (33 kΩ)
R189	7030003490	S.RESISTOR	ERJ3GEYJ 272 V (2.7 kΩ)
C1	4030007060	S.CERAMIC	C1608 CH 1H 270J-T-A
C2	4030006980	S.CERAMIC	C1608 CH 1H 070D-T-A
C3	4030007070	S.CERAMIC	C1608 CH 1H 330J-T-A
C4	4030009530	S.CERAMIC	C1608 CH 1H 030B-T-A
C5	4030007050	S.CERAMIC	C1608 CH 1H 220J-T-A
C6	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C7	4030007050	S.CERAMIC	C1608 CH 1H 220J-T-A
C8	4030007090	S.CERAMIC	C1608 CH 1H 470J-T-A
C9	4030007040	S.CERAMIC	C1608 CH 1H 180J-T-A
C10	4030007080	S.CERAMIC	C1608 CH 1H 390J-T-A
C11	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C12	4030007020	S.CERAMIC	C1608 CH 1H 120J-T-A
C13	4030009510	S.CERAMIC	C1608 CH 1H 010B-T-A
C14	4030009510	S.CERAMIC	C1608 CH 1H 010B-T-A
C15	4030007020	S.CERAMIC	C1608 CH 1H 120J-T-A
C16	4030009510	S.CERAMIC	C1608 CH 1H 010B-T-A
C17	4030009510	S.CERAMIC	C1608 CH 1H 010B-T-A
C18	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C19	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C20	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C21	4030007080	S.CERAMIC	C1608 CH 1H 390J-T-A
C22	4030007140	S.CERAMIC	C1608 CH 1H 121J-T-A
C23	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C24	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C25	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C26	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A

S.=Surface mount



# [MAIN UNIT]

REF NO.	ORDER NO.	DESCRIPTION
C27	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C28	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C29	4030007140	S.CERAMIC C1608 CH 1H 121J-T-A
C30	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C31	4030009500	S.CERAMIC C1608 CH 1H 0R5B-T-A
C32	4030007140	S.CERAMIC C1608 CH 1H 121J-T-A
C33	4030007090	S.CERAMIC C1608 CH 1H 470J-T-A
C34	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C35	4030007020	S.CERAMIC C1608 CH 1H 120J-T-A
C36	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C37	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C38	4030009910	S.CERAMIC C1608 CH 1H 040B-T-A
C39	4030006900	S.CERAMIC C1608 JB 1E 103K-T-A
C40	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C41	4030006900	S.CERAMIC C1608 JB 1E 103K-T-A
C42	4030006900	S.CERAMIC C1608 JB 1E 103K-T-A
C43	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C44	4030011600	S.CERAMIC C1608 JB 1C 104KT-N
C45	4030007040	S.CERAMIC C1608 CH 1H 180J-T-A
C46	4030006900	S.CERAMIC C1608 JB 1E 103K-T-A
C47	4030011600	S.CERAMIC C1608 JB 1C 104KT-N
C48	4030011600	S.CERAMIC C1608 JB 1C 104KT-N
C49	4030006900	S.CERAMIC C1608 JB 1E 103K-T-A
C50	4030006850	S.CERAMIC C1608 JB 1H 471K-T-A
C51	4030006900	S.CERAMIC C1608 JB 1E 103K-T-A
C52	4030011600	S.CERAMIC C1608 JB 1C 104KT-N
C53	4030006900	S.CERAMIC C1608 JB 1E 103K-T-A
C54	4030006900	S.CERAMIC C1608 JB 1E 103K-T-A
C55	4030006900	S.CERAMIC C1608 JB 1E 103K-T-A
C56	4510005810	S.ELECTROLYTIC ECEV1HAR47R
C57	4510004630	S.ELECTROLYTIC ECEV1CA100SR
C58	4510005810	S.ELECTROLYTIC ECEV1HAR47R
C59	4550006360	S.TANTALUM ECST1VY104R
C60	4550006150	S.TANTALUM ECST1CY105R
C61	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C62	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C63	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C64	4030009520	S.CERAMIC C1608 CH 1H 020B-T-A
C65	4030007060	S.CERAMIC C1608 CH 1H 270J-T-A
C66	4610002160	S.TRIMMER CTZ3S-30C-W1-AF
C68	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C69	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C70	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C72	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C73	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C74	4030006990	S.CERAMIC C1608 CH 1H 080D-T-A
C75	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C76	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C77	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C78	4030007090	S.CERAMIC C1608 CH 1H 470J-T-A
C79	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C80	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C82	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C83	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C84	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C85	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C86	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C87	4030006990	S.CERAMIC C1608 CH 1H 080D-T-A
C88	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C89	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C90	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C91	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C92	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C93	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C94	4030007070	S.CERAMIC C1608 CH 1H 330J-T-A
C95	4030007070	S.CERAMIC C1608 CH 1H 330J-T-A
C96	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C97	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C98	4030007080	S.CERAMIC C1608 CH 1H 390J-T-A
C99	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C100	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C101	4030007100	S.CERAMIC C1608 CH 1H 560J-T-A
C102	4030007050	S.CERAMIC C1608 CH 1H 220J-T-A
C103	4030007100	S.CERAMIC C1608 CH 1H 560J-T-A
C104	4510004440	S.ELECTROLYTIC ECEV1HA010SR
C105	4510006220	S.ELECTROLYTIC ECEV1CA101UP
C106	4030007050	S.CERAMIC C1608 CH 1H 220J-T-A
C107	4510004650	S.ELECTROLYTIC ECEV1EA4R7SR
C108	4030011600	S.CERAMIC C1608 JB 1C 104KT-N
C109	4510005370	S.ELECTROLYTIC ECEV1AA221P
C110	4030008860	S.CERAMIC C1608 JB 1C 153K-T-A
C111	4030008860	S.CERAMIC C1608 JB 1C 153K-T-A

# [MAIN UNIT]

REF NO.	ORDER NO.	DESCRIPTION
C112	4550006220	S.TANTALUM TEMSVA 0J 156M-8L
C113	4510004630	S.ELECTROLYTIC ECEV1CA100SR
C114	4550006560	S.TANTALUM ECST1CY225R
C115	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C116	4030006880	S.CERAMIC C1608 JB 1H 472K-T-A
C117	4030008470	S.CERAMIC C1608 JB 1H 272K-T-A
C118	4030006900	S.CERAMIC C1608 JB 1E 103K-T-A
C119	4030007150	S.CERAMIC C1608 CH 1H 151J-T-A
C120	4510004650	S.ELECTROLYTIC ECEV1EA4R7SR
C121	4030006900	S.CERAMIC C1608 JB 1E 103K-T-A
C122	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C123	4550006220	S.TANTALUM TEMSVA 0J 156M-8L
C124	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C125	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C126	4030011600	S.CERAMIC C1608 JB 1C 104KT-N
C127	4030006900	S.CERAMIC C1608 JB 1E 103K-T-A
C128	4510004650	S.ELECTROLYTIC ECEV1EA4R7SR
C129	4510005630	S.ELECTROLYTIC ECEV1EA330SP
C130	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C131	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C132	4510005430	S.ELECTROLYTIC ECEV0JA220SR
C133	4510005430	S.ELECTROLYTIC ECEV0JA220SR
C134	4510005430	S.ELECTROLYTIC ECEV0JA220SR
C135	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C136	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C137	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C138	4510005860	S.ELECTROLYTIC ECEV1HA2R2SR
C139	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C140	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C141	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C142	4510004630	S.ELECTROLYTIC ECEV1CA100SR
C143	4030011600	S.CERAMIC C1608 JB 1C 104KT-N
C144	4510006220	S.ELECTROLYTIC ECEV1CA101UP
C145	4510005430	S.ELECTROLYTIC ECEV0JA220SR
C146	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C147	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C148	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C149	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C150	4510004440	S.ELECTROLYTIC ECEV1HA010SR
C151	4030007080	S.CERAMIC C1608 CH 1H 390J-T-A
C152	4030008880	S.CERAMIC C1608 JB 1C 223K-T-A
C153	4510004650	S.ELECTROLYTIC ECEV1EA4R7SR
C154	4030011600	S.CERAMIC C1608 JB 1C 104KT-N
C156	4030011600	S.CERAMIC C1608 JB 1C 104KT-N
C164	4030007120	S.CERAMIC C1608 CH 1H 820J-T-A
C165	4030007030	S.CERAMIC C1608 CH 1H 150J-T-A
C167	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C168	4510005950	S.ELECTROLYTIC ECEV1HA0R1SR
C170	4030011600	S.CERAMIC C1608 JB 1C 104KT-N
C171	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C172	4030006900	S.CERAMIC C1608 JB 1E 103K-T-A
C173	4030006900	S.CERAMIC C1608 JB 1E 103K-T-A
C174	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C175	4550006540	S.TANTALUM ECST1CY475R
C176	4030011600	S.CERAMIC C1608 JB 1C 104KT-N
C177	4510004650	S.ELECTROLYTIC ECEV1EA4R7SR
C179	4030011600	S.CERAMIC C1608 JB 1C 104KT-N
C182	4030011600	S.CERAMIC C1608 JB 1C 104KT-N
C183	4030007070	S.CERAMIC C1608 CH 1H 330J-T-A
C185	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
C186	4030006860	S.CERAMIC C1608 JB 1H 102K-T-A
DS1	5030001460	LCD LM-1462B
DS2	5010000160	S.LED LNJ310M6URA
DS3	5010000160	S.LED LNJ310M6URA
DS4	5040002190	S.LED LNJ808R8ERA
S1	2230000990	SWITCH EVQ-PJ705K
J1	6450001690	CONNECTOR HSJ1456-01-220
J2	6450001680	CONNECTOR HSJ1122-010010
J3	6450000870	CONNECTOR HEC2711-01-020
J4	6910003840	CONNECTOR IMSA-9230B-1-05Z003-T
J5	6910010850	CONNECTOR IMSA-9230B-1-05Z080-T
	6510007080	CONNECTOR PI28A-02M
P1	6510007720	CONNECTOR PI28A-02F

S.=Surface mount



[MAIN UNIT]

REF NO.	ORDER NO.	DESCRIPTION	
W2	7030003860	S.JUMPER	ERJ3GE JPW V
W12	7030003860	S.JUMPER	ERJ3GE JPW V
WS1	8600035810	OTHER	P01MA
SP1	2510000960	SPEAKER	K036NA500-26A27
MC1	7700002160	MICROPHONE	KUC3523-040245
EP1	0910050144	PCB	B 5071E
EP2	8930042590	LCD CONTACT	SRCN-1922-SP-N-W

[VCO BOARD]

REF NO.	ORDER NO.	DESCRIPTION	
Q501	1530002920	S.TRANSISTOR	2SC4226-T2 R25
Q502	1530002920	S.TRANSISTOR	2SC4226-T2 R25
Q503	1530002920	S.TRANSISTOR	2SC4226-T2 R25
D501	1790001290	S.VARICAP	MA304(TX)
D502	1790000620	S.DIODE	MA77(TW)
L501	6200004480	S.COIL	MLF1608D R82K-T
L502	6130002950	S.COIL	LB-342
L503	6200007000	S.COIL	ELJRE 82NG-F
R501	7030003460	S.RESISTOR	ERJ3GEYJ 152 V (1.5 kΩ)
R502	7030003540	S.RESISTOR	ERJ3GEYJ 682 V (6.8 kΩ)
R503	7030003540	S.RESISTOR	ERJ3GEYJ 682 V (6.8 kΩ)
R504	7030003360	S.RESISTOR	ERJ3GEYJ 221 V (220 Ω)
R505	7030003320	S.RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R506	7030003360	S.RESISTOR	ERJ3GEYJ 221 V (220 Ω)
R507	7030003660	S.RESISTOR	ERJ3GEYJ 683 V (68 kΩ)
R508	7030003400	S.RESISTOR	ERJ3GEYJ 471 V (470 Ω)
C501	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C502	4030007170	S.CERAMIC	C1608 CH 1H 221J-T-A
C503	4030007040	S.CERAMIC	C1608 CH 1H 180J-T-A
C505	4030009520	S.CERAMIC	C1608 CH 1H 020B-T-A
C506	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C507	4030009520	S.CERAMIC	C1608 CH 1H 020B-T-A
C508	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C509	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C510	4030009500	S.CERAMIC	C1608 CH 1H 0R5B-T-A
C511	4030006860	S.CERAMIC	C1608 JB 1H 102K-T-A
C512	4030007070	S.CERAMIC	C1608 CH 1H 330J-T-A
J501	6910010840	CONNECTOR	IMSA-9230B-1-05Z057-T
EP501	0910050152	PCB	B 5072B

[VR BOARD]

REF NO.	ORDER NO.	DESCRIPTION	
R401	7210002950	VARIABLE	RV-312(RK0971110)
EP401	0910050161	PCB	B 5073A

S.=Surface mount

# SECTION 7 MECHANICAL PARTS AND DISASSEMBLY

## 7-1 CABINET PARTS

### [CHASSIS PARTS]

REF NO.	ORDER NO.	DESCRIPTION	QTY.
J801	6510020350	Antenna connector BNC-R148	1
MP801	8010017200	2078 Chassis	1
MP802	8210014900	2065 Front panel	1
MP804	8210014330	1922 Contact base	1
MP805	8610010420	Knob N261	1
MP806	8930046130	2065 7-key (B)	1
MP807	8930042070	1922 MIC cap	1
MP809	8930042030	1922 Main seal	1
MP811	8930042050	1922 DC cap	1
MP812	8930042090	1922 Plus terminal	1
MP813	8930042080	1922 Minus terminal	1
MP817	8310040680	1922 Window plate (E)	1
MP821	8930042350	1922 Mic sheet	1
MP824	8830001250	ANT Connector-101 Nut	1
MP825	8830001010	HEX Nut(A)	1
MP826	8810000100	Screw PH M2 × 4 ZK	2
MP827	8810009510	Screw PH B0 M2 × 4 NI-ZU (BT)	6
MP828	8810009510	Screw PH B0 M2 × 4 NI-ZU (BT)	1
MP829	8810009510	Screw PH B0 M2 × 4 NI-ZU (BT)	2
MP830	8810009560	Screw PH B0 M2 × 6 ZK (BT)	2
MP831	8810009560	Screw PH B0 M2 × 6 ZK (BT)	2
MP835	8930043760	1923 MIC seal	1
MP838	8510011170	1902 VCO cover	1
MP840	8930047430	1902 Rear sheet (H)	1
MP843	8930043610	Isolating sheet EZ	1
MP844	8860001060	1989 ANT rug	1

Screw abbreviations: PH: Pan head B0: Self-tapping  
NI: Nickel ZK: Black

### [MAIN UNIT]

REF NO.	ORDER NO.	DESCRIPTION	QTY.
DS 1	5030001460	LCD LM-1462B	1
EP 2	8930042590	LCD contact SRCN-1922-SP-N-W	1
MP1	8410002230	2078 PA heatsink	1
MP2	8930046820	1922 LCD holder (A)	1
MP3	8210014380	1922 Reflector	1
MP5	8510011770	2078 VCO shield plate	1
SP 1	2510000960	Speaker K036NA500-26A27	1

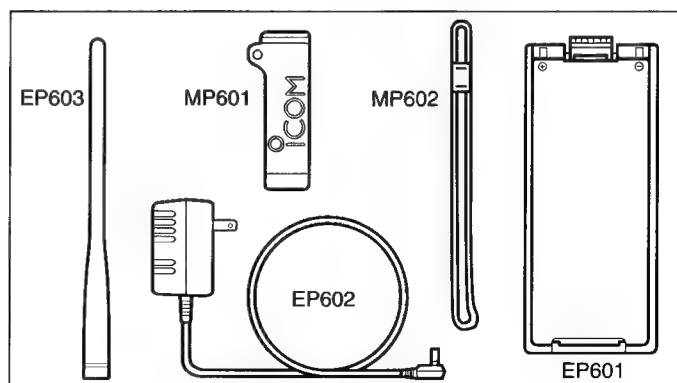
### [VCO BOARD]

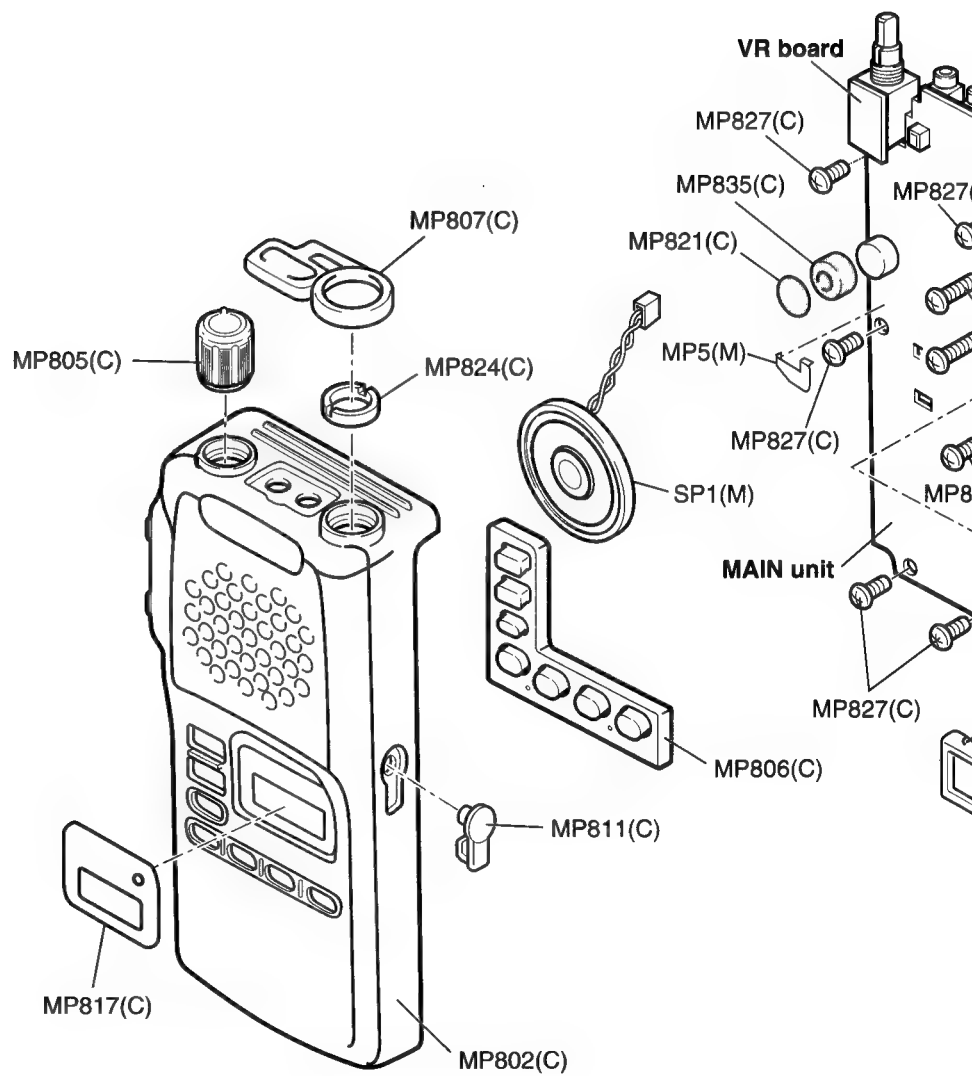
REF NO.	ORDER NO.	DESCRIPTION	QTY.
MP501	8510010920	1902 VCO case	1

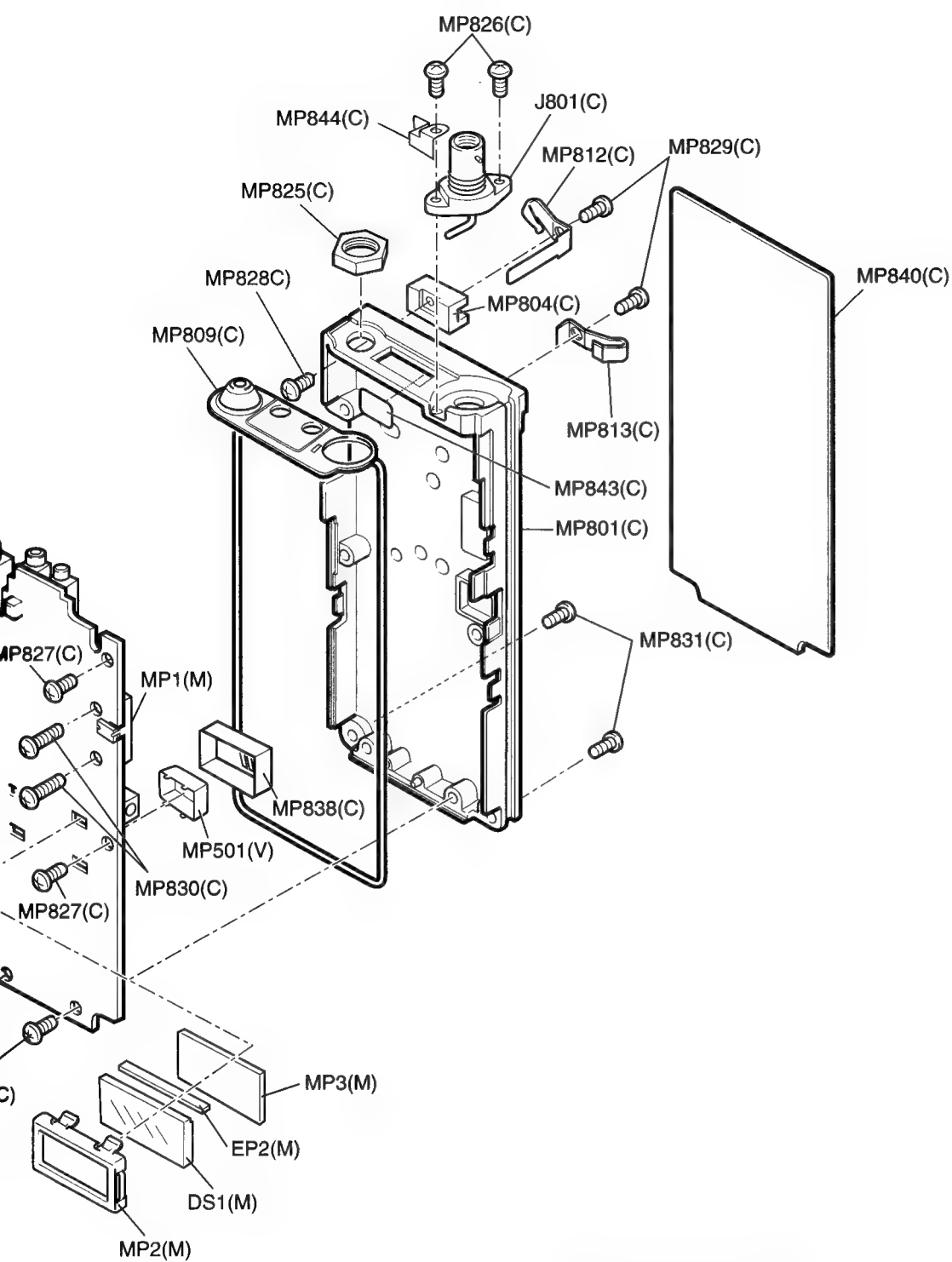
## 7-2 ACCESSORIES

REF NO.	ORDER NO.	DESCRIPTION	QTY.
EP601	Optional product	Battery pack BP-195 (d/v)	1
EP602	Optional product	Battery case BP-194 (d/v)	1
EP602	Optional product	Wall charger BC-110 A/D/V (d/v)	1
EP603	Optional product	Antenna FA-B02AR	1
MP601	Optional product	Belt clip MB-68	1
MP602	8010011960	Strap belt HK-005	1

(d/v): (depending on version)







# **Note**

- (M) : MAIN unit
- (C) : CHASSIS
- (V) : VCO board

# SECTION 8 SEMI-CONDUCTOR INFORMATION

## 8 - 1 TRANSISTORS

NAME	SYMBOL	INSIDE VIEW
2SA1586-GR 2SA1622-6	SG M6	
2SB1132 - R	BAR	
2SB1201-S	2M	
2SC3357-RF	RF	
2SK2596BXTL	BX	
2SC4116-BL 2SC4211-6 2SC4215-O 2SC4226-R25 2SC4403-3 2SD1819A-R	LB L6 QO R25 LY3 Z•R	
2SK2973	K1	

NAME	SYMBOL	INSIDE VIEW
2SK3075	RF 72	
3SK151-Y	UH	
3SK230-U1B	U1B	
DTC114YU UN9211	64 8A	
UMS1	S1	
UN9210	8L	
XP4315	CB	

NAME	SYMBOL	INSIDE VIEW
XP4601	5C	

## 8 - 2 DIODES

NAME	SYMBOL	INSIDE VIEW
1T365-01	pink line	
1SS375 DA204U HSM88AS MA133	FH K C1 MP	
DAN202U	N	
HSU88TRF HVU17TRF	9 E	
1SV246 HVU350TRF	CV 4	

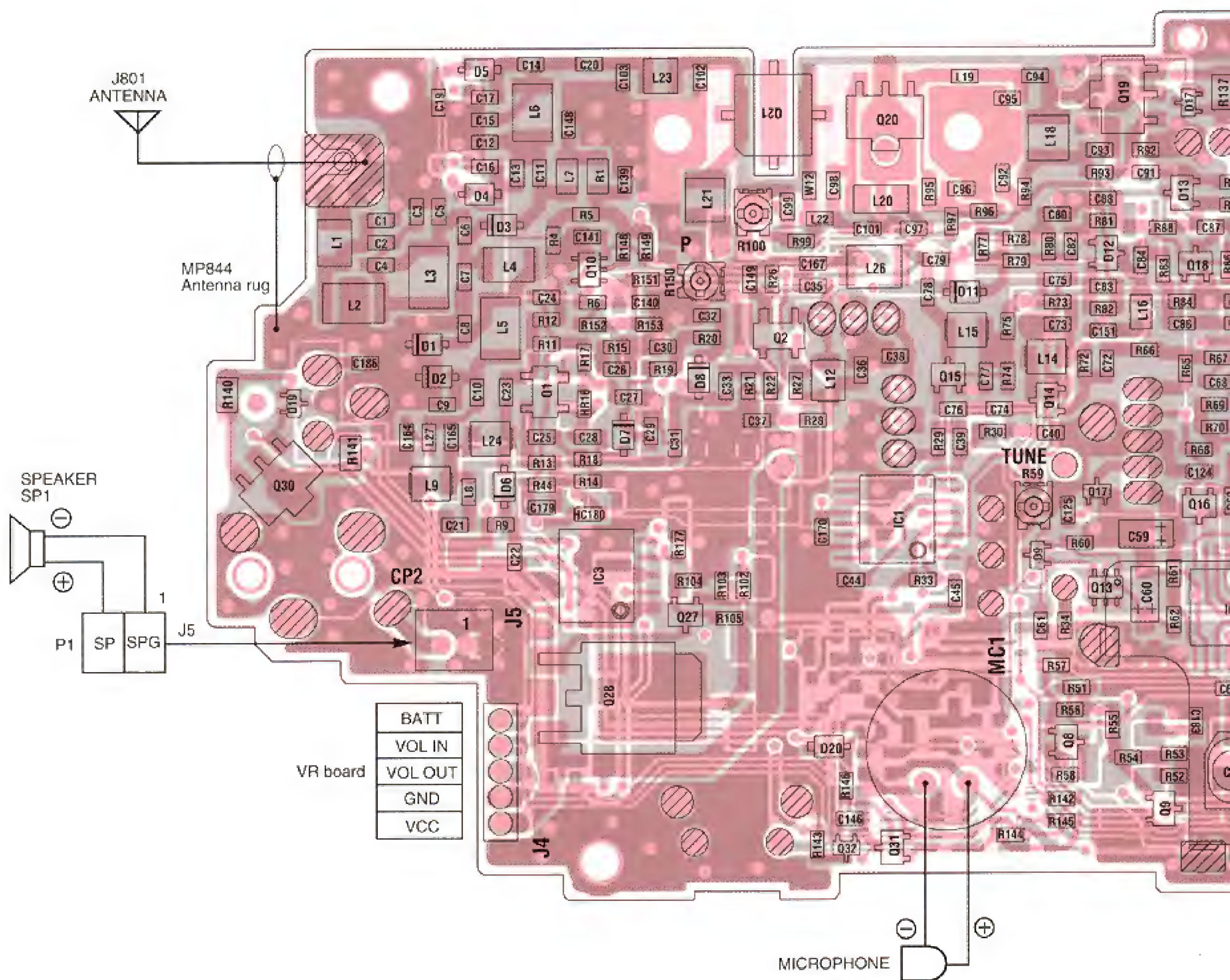
NAME	SYMBOL	INSIDE VIEW
MA77 MA304	4B 7R	
MA111 MA728	1B 2A	
MA8024 MA8036 MA8051	2.4 3_6 5^1	
MA6S121	M2D	
SB07-03C-TB	J	



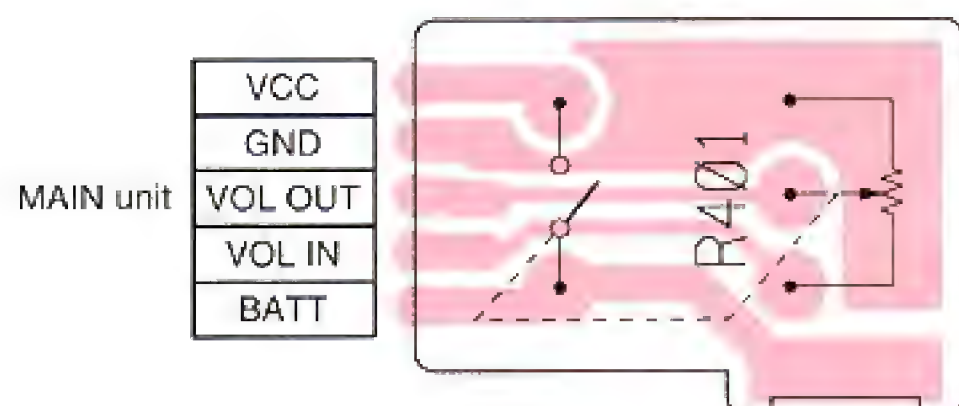
## SECTION 9 BOARD LAYOUTS

## 9 - 1 MAIN UNIT

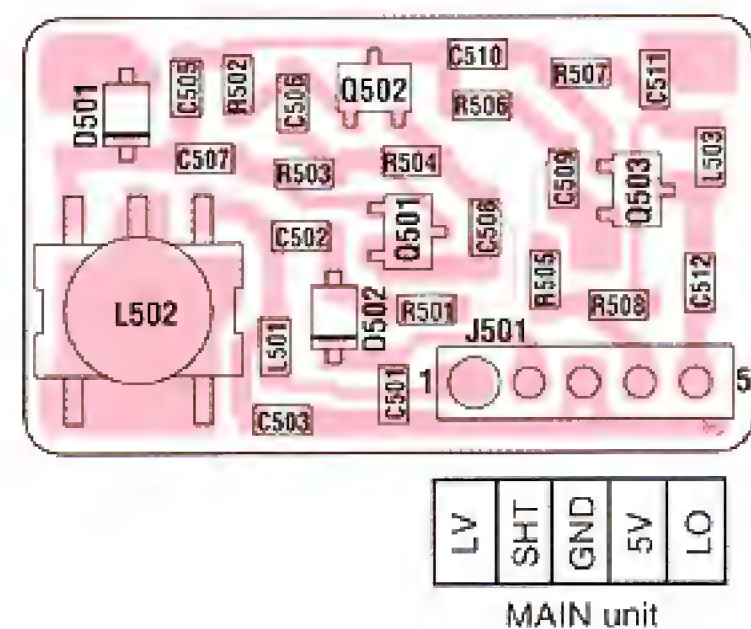
• TOP VIEW



## 9 - 2 VR BOARD

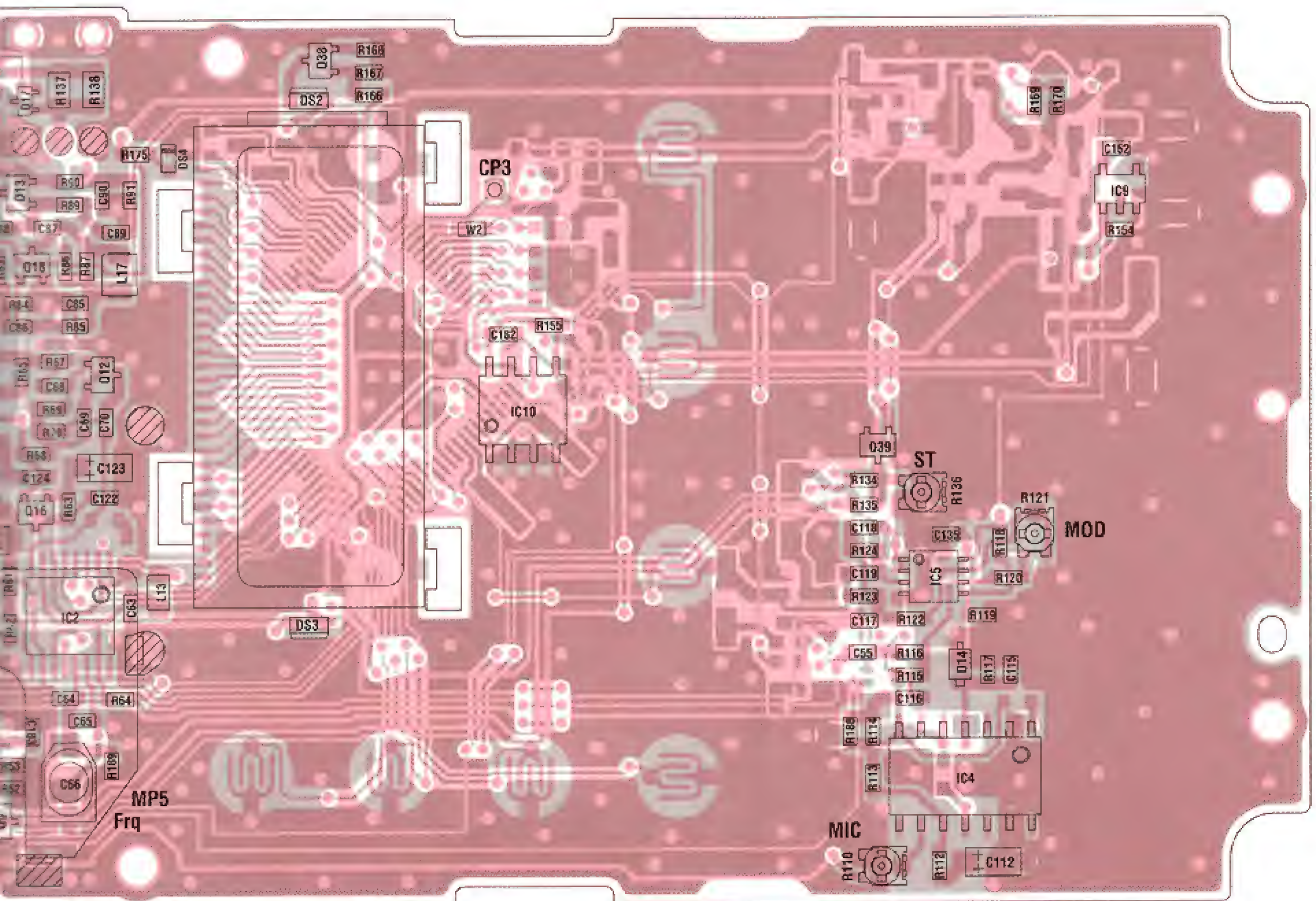


### 9 - 3 VCO BOARD



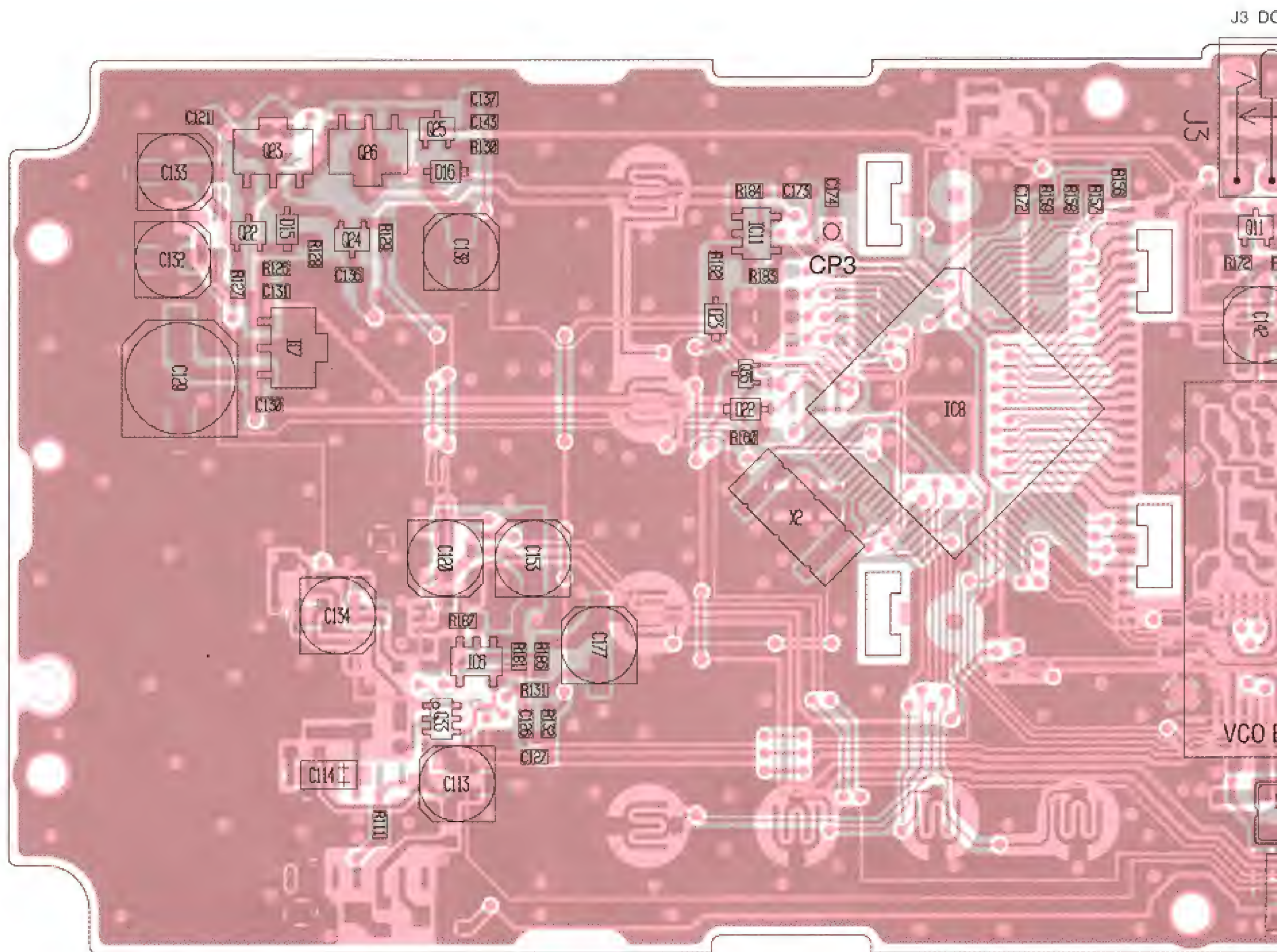


The combination of this page and the next page shows the unit layout in the same configuration as the actual P.C. Board.



Surface Inside Underside

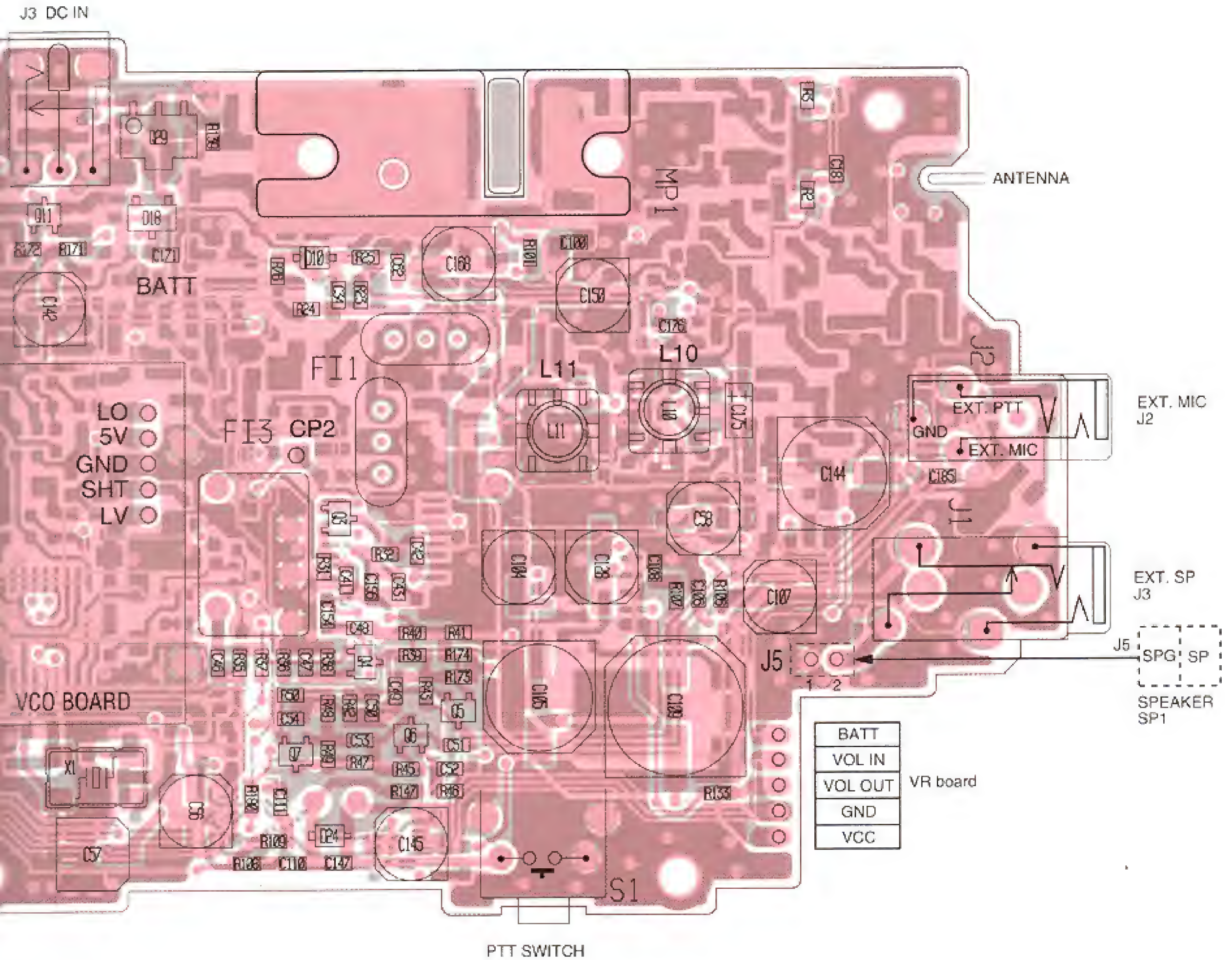




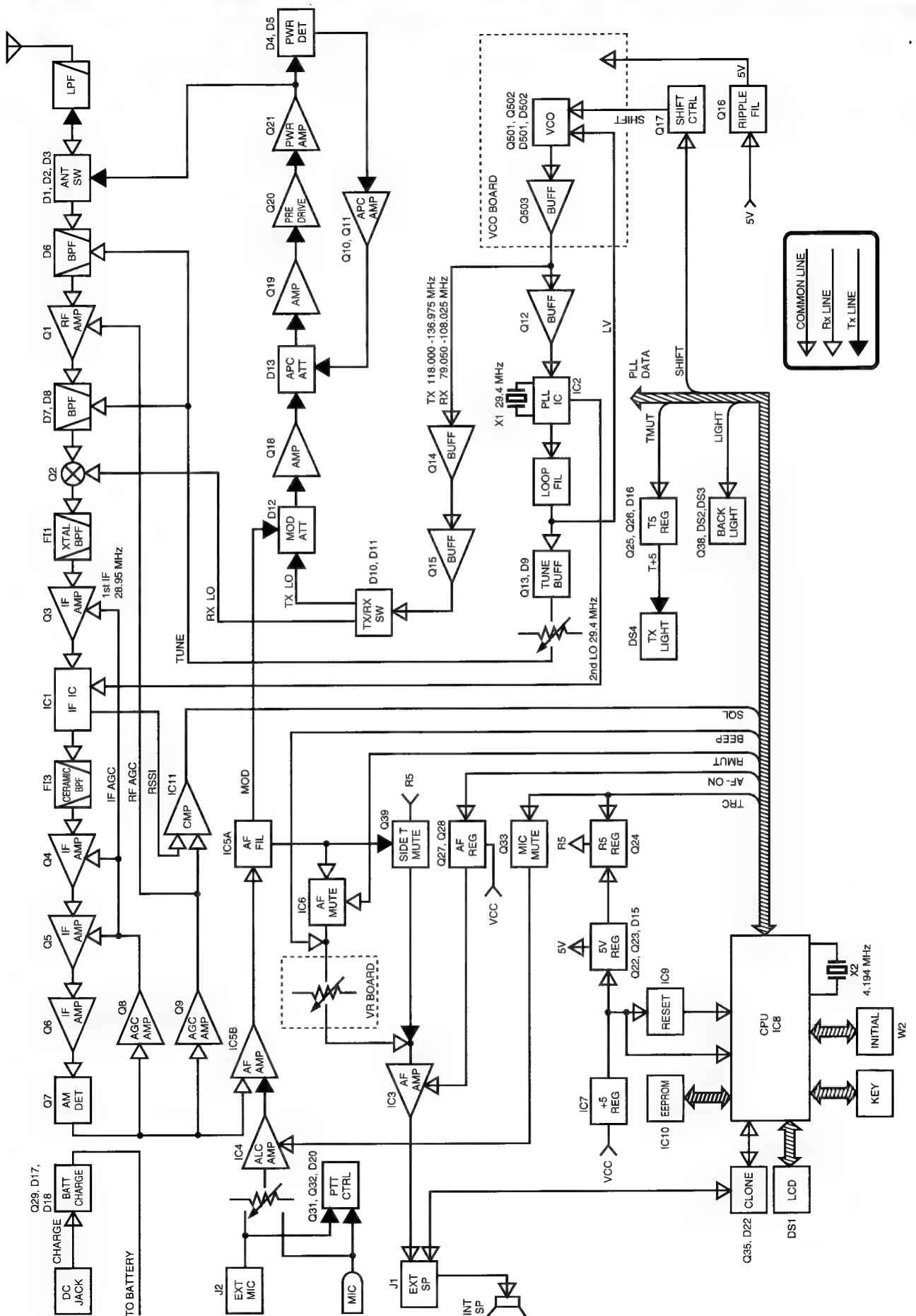
Surface Inside Underside



The combination of this page and the previous page shows the unit layout in the same configuration as the actual P.C. Board.

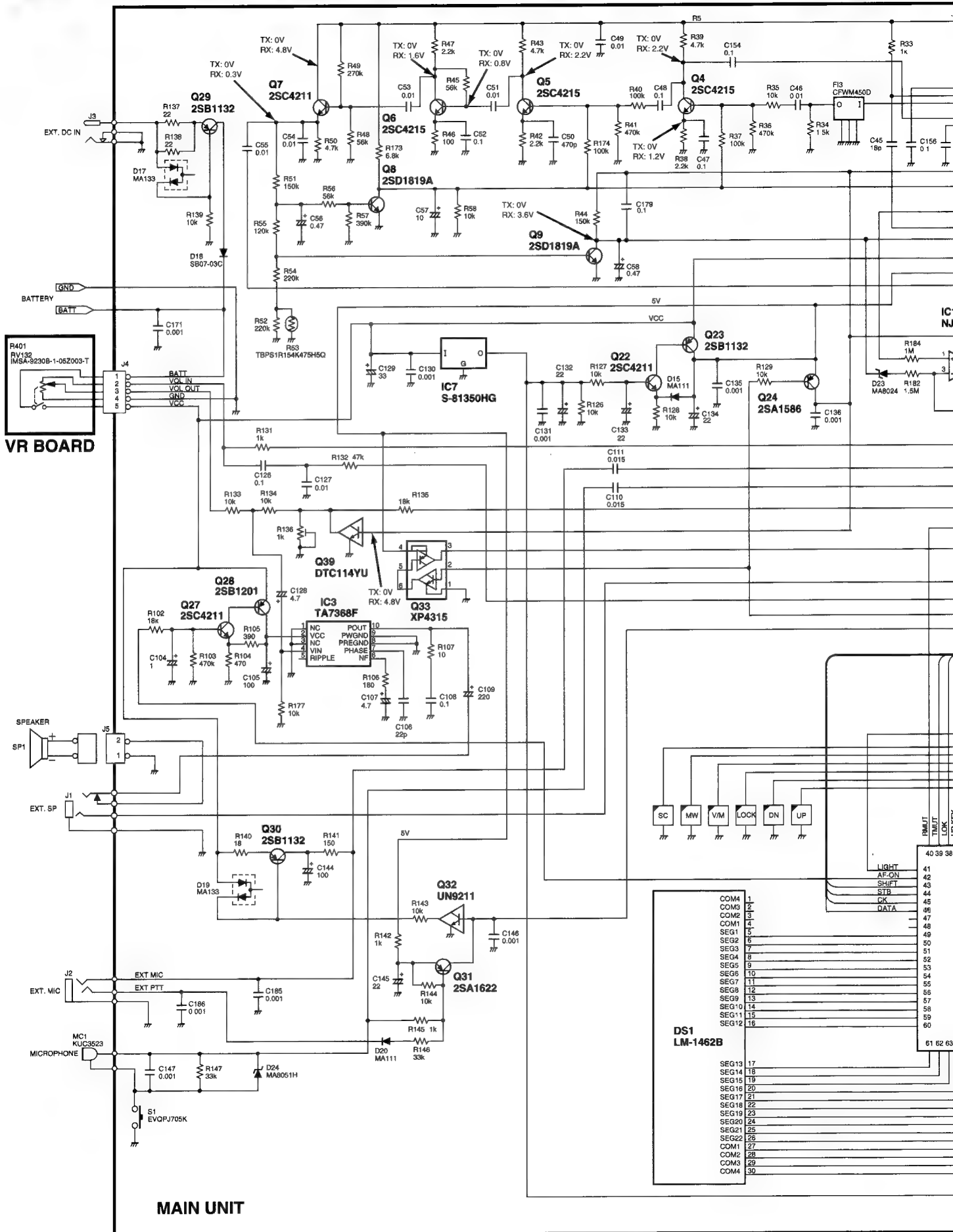


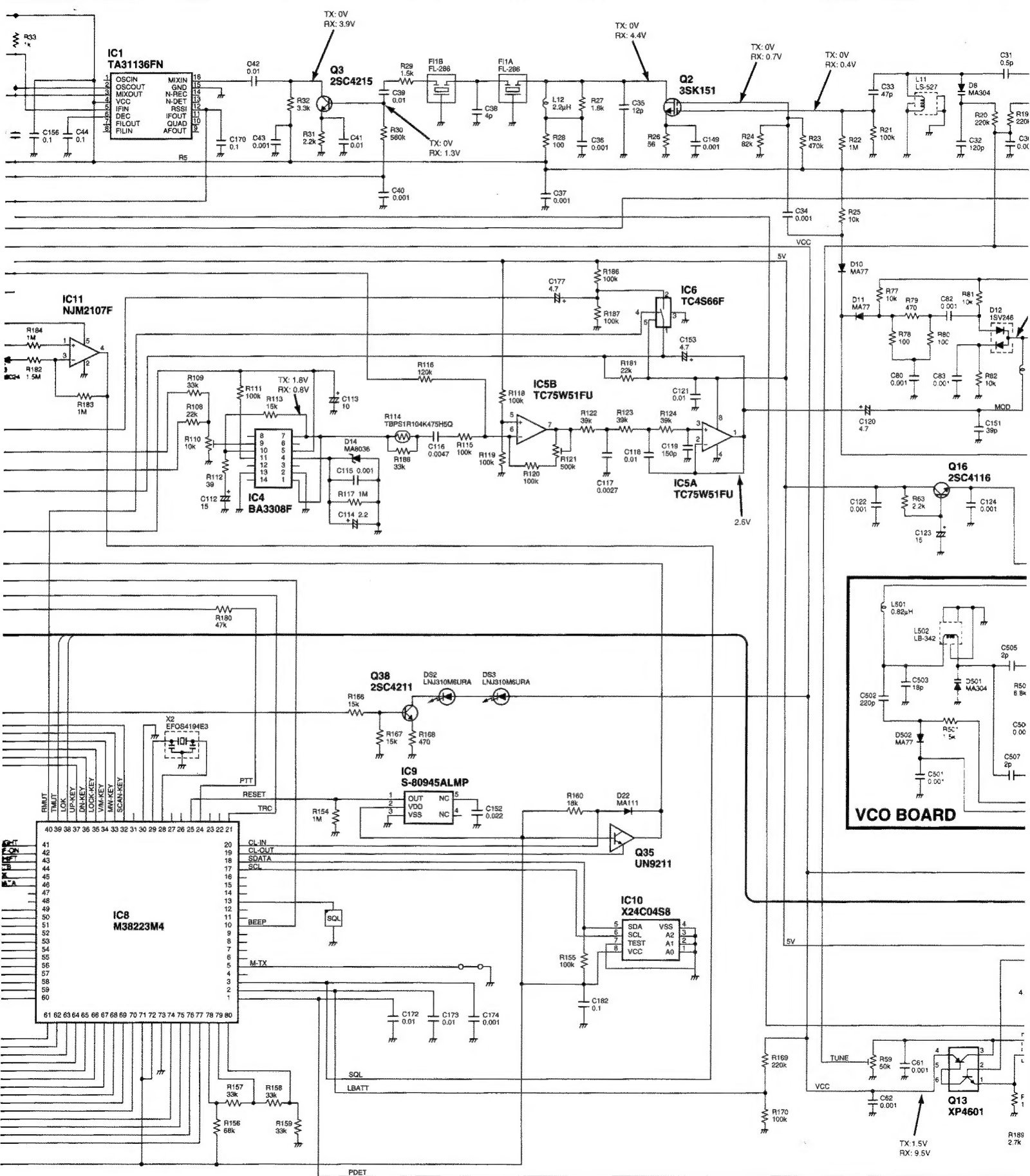
# SECTION 10 BLOCK DIAGRAM

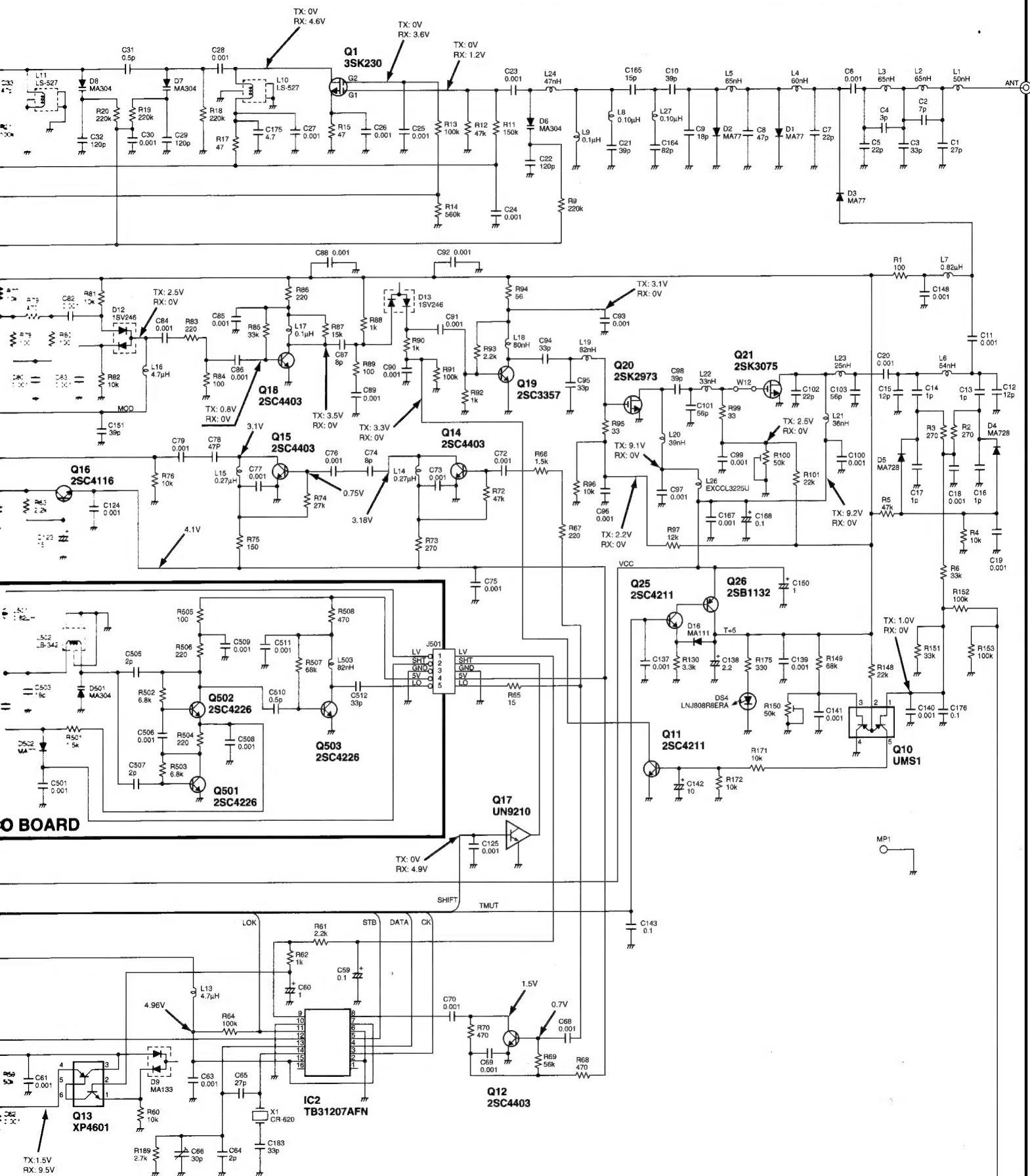




# SECTION 11 VOLTAGE DIAGRAM







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